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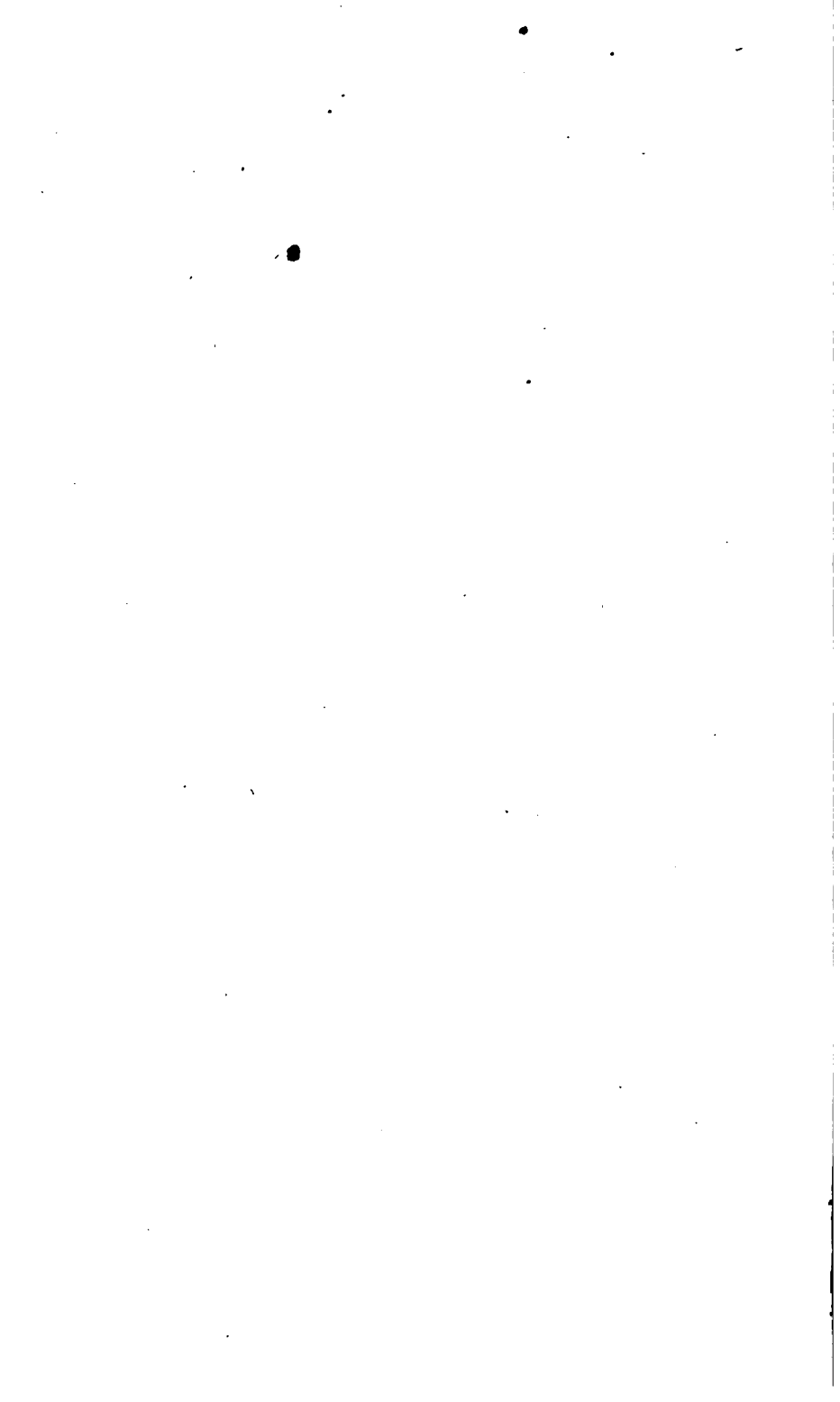
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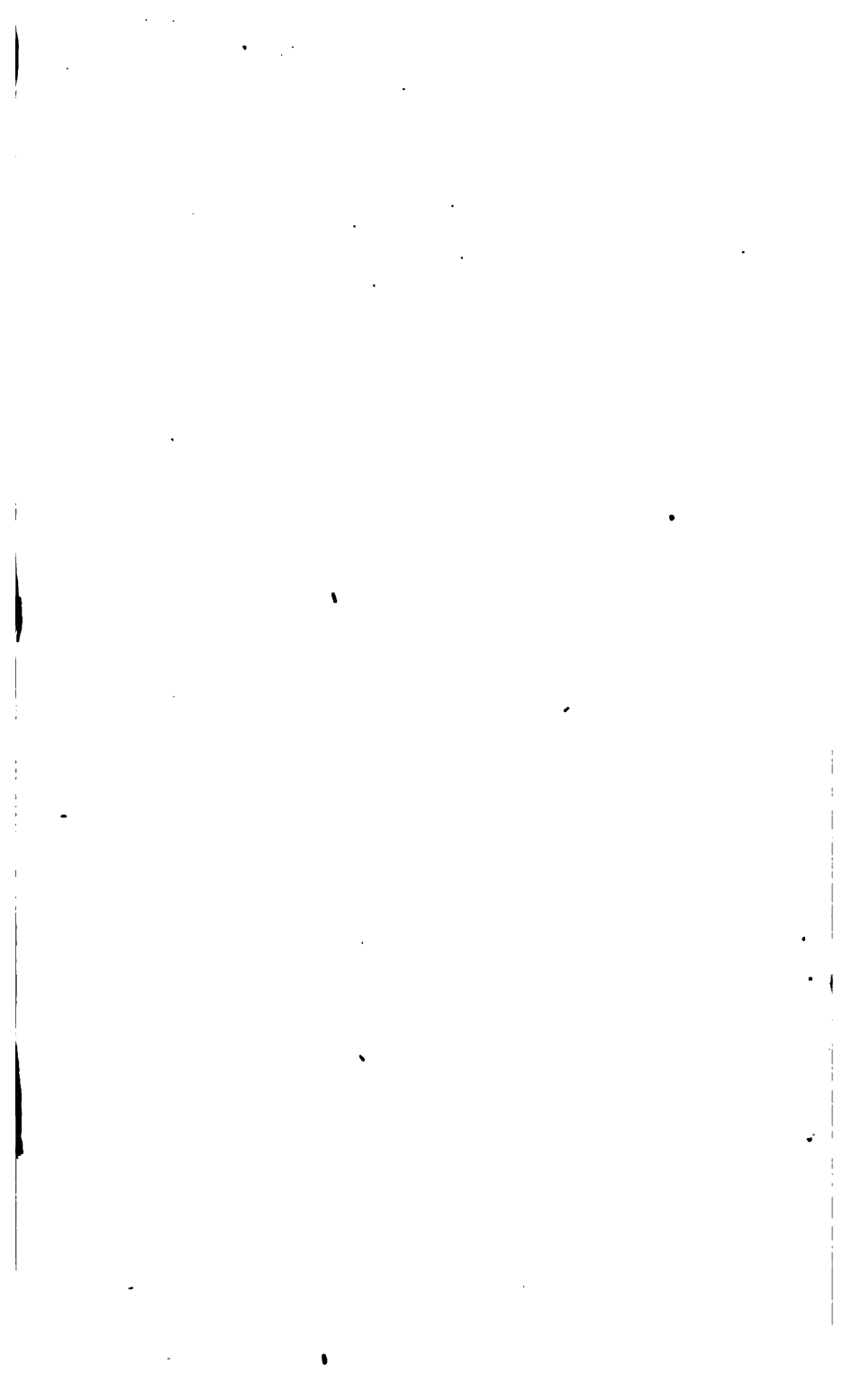


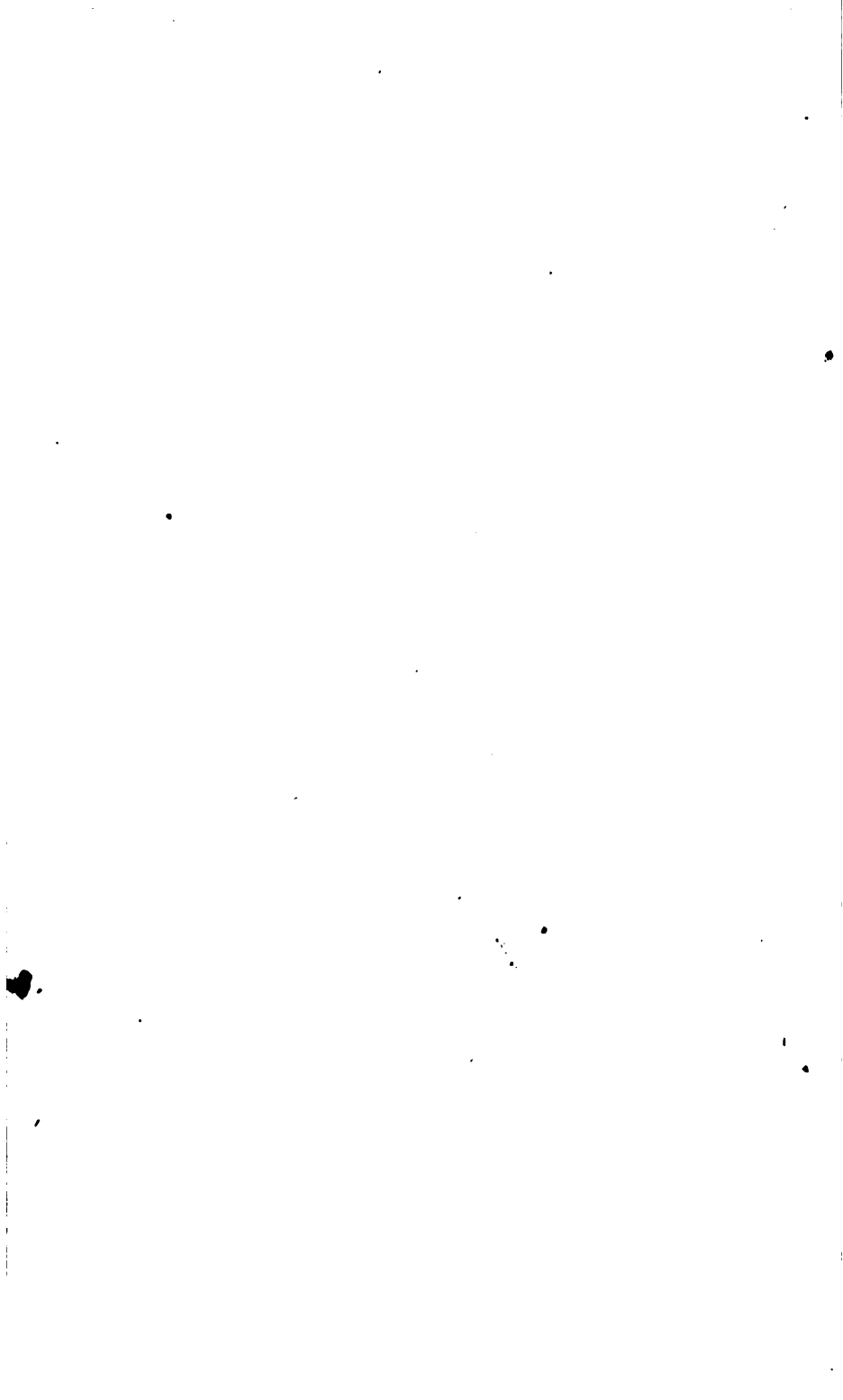
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A CONCISE VIEW  
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IN  
MEDICINE, SURGERY, AND  
PHARMACY.

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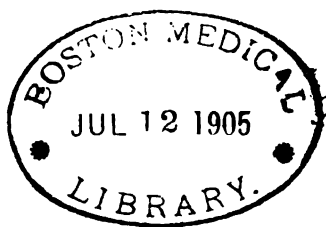
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THE HARVEIAN Society of Edinburgh having instituted an Annual Prize, to be competed for by Physicians or Surgeons who have been educated at the Edinburgh School of Medicine, and have not been more than five years in practice, hereby give notice that the subject of their Prize Essay for 1849 is "The Physiological and Pathological Effects of Alcoholic Liquors on the Human Body;" and that for 1850, "The Anatomy, Physiology, and Pathology of Menstruation."

Dissertations on the first mentioned subject must be lodged with one or other of the Secretaries of the Society, on or before the first day of October 1848; and dissertations on the second mentioned subject on or before the first day of October 1849. Each dissertation must be accompanied by a sealed letter, containing the name and address of the author, and inscribed on the back with a motto, the same motto being also prefixed to the corresponding Essay. None of the sealed letters will be opened, except that bearing the same motto with the successful Essay.

The Prize given by the Society will be an elegant Gold Medal, with a suitable inscription.

The successful candidate will be at liberty to employ his Essay afterwards in any way he may think proper.

By order of the Society.

RICHARD HUIE, M. D., 8 George Square, }  
P. D. HANDYSIDE, M. D., 45 York Place, } Secretaries.  
Edinburgh, 22d June 1847.

## NOTICES TO CORRESPONDENTS.

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Communications have been received from Dr BLAIR, Dr HALL, Dr WILSON, Mr C. H. HALLETT, Mr YOCKING, and G. M.

The following publications have been received :—

Thoughts on the Nature and Treatment of several Severe Diseases of the Human Body. By Edward J. Seymour, M. D., F. R. S., late Physician to St George's Hospital, &c. &c. &c. In two volumes. Vol. I. London, 1847. 8vo. Pp. 260.

A Treatise on the Structure, Diseases, and Injuries of the Blood-vessels, with Statistical Deductions, being the Essay to which the Jacksonian Prize, for the year 1844, was awarded by the Royal College of Surgeons of England, with numerous Additions. By Edward Crisp, M. R. C. S., Member of the Council of the Pathological and Medical Societies of London, &c. &c. London, 1847. 8vo. Pp. 354.

A Treatise on Fractures in the vicinity of the Joints, and on certain Forms of Accidental and Congenital Dislocations. By Robert William Smith, M. D. M. R. I. A., Fellow of the Royal College of Surgeons, Ireland, &c. &c. Dublin, 1847. 8vo. Pp. 314.

Practical Observations on the Pathology and Treatment of certain Diseases of the Skin, generally pronounced Intractable. Illustrated by upwards of Forty Cases. By Thomas Hunt, M. R. C. S. England, L. S. A. &c. &c. London, 1847. 8vo. Pp. 156.

A Treatise on the Plague, more especially on the Police Management of that disease. Illustrated by the plan of operations successfully carried into effect in the late Plague of Corfu. With Hints on Quarantine. By A. White, M. D., Deputy-Inspector-General of Military Hospitals, and late Superintendent of the Plague in Corfu, &c. &c. London, 1846. 8vo. Pp. 342.

The Surgeons' Vade Mecum. By Robert Druitt, Fellow of the Royal College of Surgeons. Fourth Edition, much improved, and illustrated with One Hundred and Fifty-Six highly finished Wood Engravings. London, 1847. 12mo. Pp. 620.

A Treatise on Diet and Regimen. By William Henry Robertson, M.D., Physician to the Buxton Bath Charity. Fourth Edition. Rewritten and much enlarged. Part II. p. 117-296. June 1847. To be completed in Five or Six Parts; published at intervals of three months. Part III. on the First of September. 8vo.

Physical Education and the Preservation of Health. By John C. Warren, M. D., Professor of Anatomy and Surgery in Harvard University. Boston, 1846. 12mo. Pp. 90.

On Wounds and Injuries of the Arteries of the Human Body; with the Treatment and Operations required for their Cure. Illustrated by 130 cases, selected from the Records of the Practice of the most celebrated Surgeons in Europe and America. With the critical remarks of the



Author on each. By G. T. Guthrie, F. R. S. London, 1846. Large 8vo. Pp. 97.

Observations on Aneurism, and the Treatment by Compression. By O'Bryen Bellingham, M. D, Edinburgh, Fellow of, and Professor in the School of the Royal College of Surgeons in Ireland, &c. &c. London, 1847. 12mo. Pp. 181.

The Microscopic Anatomy of the Human Body in Health and Disease. Illustrated with numerous Drawings in Colour. By Arthur Hill Hassall. Part ix. 1847. 8vo. Pp. 295-327.

Observations on the Healthy and Diseased Properties of the Blood. By William Stevens, M.D. London, 1832. 8vo. Pp. 504.

Hydropathy and Homœopathy impartially appreciated. With an Appendix of Notes, illustrative of the Influence of the Mind and the Body. By Edward Lee, Esq., Fellow of the Royal Medico-Chirurgical Society, &c. &c. The three editions combined. London, 1847. 12mo. Pp. 139.

On Dyspepsia. With Remarks. Submitted in support of the opinion, that the proximate cause of this, and of all other Diseases affecting the General System, is Vitiation of the Blood. By John Burdett Stewart, M.D., Fellow of the Royal College of Physicians. London, 1847. 12mo. Pp. 106.

Report on the Fever at Bona Vista. By Dr M<sup>c</sup>William. Presented to the House of Commons in pursuance of their Address of the 16th March 1847. Folio. Pp. 112.

The Transactions of the Provincial Medical and Surgical Association. Instituted 1832. New Series. Vol. III. London and Worcester, 1847. 8vo. Pp. 437.

Speech of Lieut.-Gen. Sir Howard Douglas, M. P. for Liverpool, on the Army Surgeons' Bill, in the House of Commons. Monday, April 12, 1847. 12mo. Pp. 14.

Vaccination considered in relation to the Public Health; with Inquiries and Suggestions thereon. A Letter addressed to the Right Hon. Lord Viscount Morpeth, First Commissioner of Her Majesty's Woods and Forests. By John Marshall, Surgeon, Member of the Committee of the Health of Towns' Association. London, 1847. 8vo. Pp. 34.

The Medico-Chirurgical Review and Journal of Practical Medicine. New Series, No. 10, 92 of old. April, 1847. London, 8vo.

The British and Foreign Quarterly Review, or Quarterly Journal of Practical Medicine and Surgery. Edited by John Forbes, M. D., &c. No. 46. April, 1847. London, 8vo.

The London Medical Gazette, or Journal of Practical Medicine. No. 99 and 1007, 19th March 1847, to No. 111 and 1019, 11th June 1847.

The Dublin Quarterly Journal of Medical Science. No. 6, May 1847. Dublin, 8vo.

Weekly Tables of Mortality for the Metropolis. No. 11, Saturday, March 11, 1847. No. 23, 5th June 1847.

Summary of the Weekly Tables of Mortality for 1846. Annual Series VII. Published by Authority of the Registrar-General, General Registrar Office, Somerset House, February 18, 1847.

Quarterly Return of the Health and Mortality in 117 Districts of England, for the Quarter ending 31st March 1847. Annual Series VI. Pp. 30. Folio.

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EDINBURGH  
MEDICAL AND SURGICAL JOURNAL.

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| 7. On the Intimate Structure of the Human Kidney, and on the<br>Changes which its several component parts undergo in Bright's<br>Disease. By JOSEPH TOYNBEE, F. R. S.,                                                                         | ib. |
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Communications have been received from Mr HALLET, Mr TAIT, Mr WEIR, and Dr BUCHANAN ; and from Messrs HODGES and SMITH, who are requested to consult April No.

The following publications have come to hand :—

**A Treatise on the Diseases of the Air Passages: Comprising an Inquiry into the History, Pathology, Causes, and Treatment of those Affections of the Throat called Bronchitis, Chronic Laryngitis, Clergyman's Sore Throat, &c. &c.** By Horace Green, A. M., M. D., formerly President and Professor of the Theory and Practice of Medicine in the Castleton Medical College, &c. &c. New York and London, 1846. 8vo, pp. 276.

**On the Causes and Treatment of Abortion and Sterility. Being the Result of an Extended Practical Inquiry into the Physiological and Morbid Conditions of the Uterus, with Reference especially to Leucorrhœal Affections and the Diseases of Menstruation.** By James Whitehead, F. R. C. S., Surgeon to the Manchester and Salford Lying-in Hospital. London, 1847. 8vo, pp. 426.

**The Pathological Anatomy of the Human Body.** By Julius Vogel, M.D., Professor of Clinical Medicine at the University of Giessen. Translated from the German, with Additions, by George E. Day, M. A. and L. M. Cantab. Member of the R. College of Physicians, &c. &c. Illustrated with upwards of One Hundred Plain and Coloured Engravings. London, 1847. 8vo, pp. 587.

**Observations on the History and Treatment of Dysentery and its Combinations; with an Examination of their Claims to a Contagious Character, and an Inquiry into the Source of Contagion in its Analogous Diseases, Angina, Erysipelas, Hospital Gangrene, and Puerperal Fever.** By William Harty, M. D., Physician to the King's Hospital and to the Prisons of Dublin, &c. &c. Second Edition. Dublin, 1847. 8vo, pp. 303. Acknowledged in April Number. But Publishers or Author not aware.

**Consumption of the Lungs and Asthma Arrested and Cured, in the majority of cases, by Inhalation and other rational means; containing all the Remedies and Plans necessary in every stage of those diseases, &c.** By Daniel Carr, M. D., &c. London, Edinburgh, Glasgow, Dublin, 1847. 12mo. Pp. 203.

**Letters from Graefenberg, in the years 1843, 1844, 1845, and 1846. With the Report and Extracts from the Correspondence of the Enniscorthy Hydropathic Society.** By John Gibbs. London, 1847. 12mo. Pp. 280.

**Cholera, Dysentery, and Fever, Pathologically and Practically considered; or the Nature, Causes, Connections, and Treatment of these Diseases in all their Forms.** By Charles Searle, M. D., M. R. C. S. E., late of the East India Company's Madras Establishment. London, 1847. 12mo Pp. 128.

**Remarks on Medical Organization and Reform, (Foreign and English.)** By Edwin Lee, Fellow of the R. M. Chir. Society, &c. &c. With an Appendix. London, 1846. 8vo. Pp. 121.

**Remarks on the Diet of Children, and on the Distinctions between the Digestive Powers of the Infant and the Adult.** By George T. Cream. London, 1847. 12mo. Pp. 201.

**The Physiological Anatomy and Physiology of Man.** By Robert Bentley Todd, M. D., F. R. S., &c. and William Bowman, F. R. S., &c. Part Third. London, 1847. Pp. 200.

**An Account of the late Epidemic Scarlatina in Newcastle and its neighbourhood.** By Edward Charleton, M. D., Ed. &c. Newcastle-upon-Tyne, 1847. 8vo. Pp. 62.

**Some Account of the Letheon ; or, Who is the Discoverer ?** By Edward Warren. Third Edition, Revised and Enlarged. Boston. 1847. 8vo. Pp. 88.

**Bericht von einigen nicht häufig vorkommenden und einigen noch nicht beobachteten Variationen in der Verzweigung der Augennerven und ihrer Verbindung mit einander.** Von Dr Erik Spitzer, Professor, Oberärzte u. z. w. Kopenhagen, 1845. 4to. Seite 34, mit Tafeln fünf Abbildungen.

**Introductory Discourse on Pathology and the Practice of Medicine.** By Robert Spittal, M. D., F. F. R. S. E., &c. Edinburgh, 1847. 12mo. Pp. 56.

**The Human Brain ; its Structure, Physiology, and Diseases, with a Description of the Typical Forms of Brain in the Animal Kingdom.** By Samuel Solly, F. R. S., Senior Assistant Surgeon to St Thomas's Hospital, &c. &c. Second Edition, with Numerous Wood Engravings. London, 1847. 8vo. Pp. 688.

**Twenty-Seventh Report of the Directors of the Dundee Royal Asylum for Lunatics ; submitted, in terms of their Charter, to a General Meeting of Directors, 21st June 1847, with the Report of the Medical Officers.** 8vo. Dundee, 1847. Pp. 58.

**The Transactions of the Provincial Medical and Surgical Association, instituted 1832.** Vol. XV. New Series, Vol. III. London and Worcester, 1847.

**The Medico-Chirurgical Review and Journal of Practical Medicine.** New Series. No. 11. 93 of old Series, July 1847. London. 8vo.

**The British and Foreign Quarterly Review, or Quarterly Journal of Practical Medicine and Surgery.** Edited by John Forbes, M. D., &c. No. 47, July 1847. London. 8vo.

**The London Medical Gazette, or Journal of Practical Medicine.** No. 102 and 1020, 18th June 1847, to No. 1025 and 1033, 17th September 1847.

**The Dublin Quarterly Journal of Medical Science,** No. 5. February 1847.

**The Southern Journal of Medicine and Pharmacy.** January March, May, 1847.

**The American Journal of Medical Sciences.** Edited by Isaac Hays, M. D., &c. No. 27, July 1847. Philadelphia.

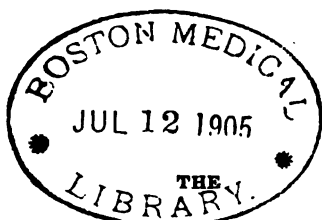
**Proceedings of the National Medical Conventions, held in New York, May 1846, and in Philadelphia, May 1847.** Philadelphia, 1847. 8vo. Pp. 175.

**Norsk Magazin for Laegevidenskaben Udgivet af Laegeforeningen i Christiania.** Anden Raekke. Redigeret af Faye, W. Boeck, Lund, Voss, A. W. Munster. I Binde 5 Hefte. Christiania, 1847. A new Norwegian Journal.

**Weekly Tables of Mortality for the Metropolis.** No. 24, 12th June 1847 ; No. 38, September 18th, 1847.

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Communications and Works to be addressed to Messrs Longman & Co. London ; or Messrs A. & C. Black, Edinburgh.



EDINBURGH

# MEDICAL AND SURGICAL JOURNAL.

1. JULY 1847.

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## PART I.

### ORIGINAL COMMUNICATIONS.

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**ART. I.—Contributions to the Pathology of the Brain.** By **ROBERT BOYD, M. D.**, Resident Physician to the Parochial Infirmary, and Physician to the Pauper Lunatic Asylum, St Marylebone. (Continued from Vol. lxvii. p. 489.)

#### TABLE VIII. CANCER. (2 MALES AND 1 FEMALE.)

**Case 784.** A coachman, aged 50 years, married. Cancerous tumours on the *dura mater*, complicated with softening of the brain; pneumonia and diseased liver. Admitted to the Infirmary twelve days before his death. Hemiplegia of the right side had existed for six months; after admission he had several convulsive fits; twitchings of the muscles of the face; the face was flushed. He was dull in comprehending and slow in answering questions. Seven days after admission he became suddenly worse, and was never able to speak afterwards.

**Head.**—The structure of the brain softened and torn in removing the *dura mater*, which last was thickened over the posterior half and outer side of the left cerebral hemisphere; several scirrhus tumours of various sizes, from a pin's head to a pistol bullet, were adherent to the thickened *dura mater* and imbedded in the brain, which was softened all around, and like cream cheese in colour. The right cerebral hemisphere and remainder of the brain quite healthy; about one ounce of clear fluid in the lateral ventricles. Weight of the brain, 43½ ounces.

*Chest*.—No pleuritic adhesions ; the lower lobe of the right lung in the first stage of pneumonia. The right lung weighed 30 ounces ; the left 16 ounces ; and the heart  $11\frac{1}{2}$  ounces.

*Abdomen*.—The peritoneum adherent to the right lobe of the liver, on the upper surface of which it was quite opaque and thickened ; some small cysts filled with dark glairy fluid were found beneath the thickened membrane, as well as some cells near the surface of the right lobe ; the liver was enlarged and of a light brown colour ; weight, 65 ounces ; the spleen large, 15 ounces ; the kidneys enlarged, 13 ounces ; the renal capsules, 1 ounce ; the pancreas, 4 ounces ; and the stomach, 5 ounces. Weight of the body 111 pounds ; height, 5 feet 8 inches.

Case 785. A male, aged 52 years. Cancer of the cerebellum complicated with abscess in the brain and cancer of the left lung and liver. He was not a patient in the Infirmary, but had been confined to bed ill at home for twelve months before his death.

*Head*.—The *dura mater* adherent to the anterior portion of the left cerebral hemisphere ; on raising it the under surface was red, and about a teaspoonful of purulent matter was found beneath. A second abscess, filled with purulent matter, about two inches long and more than one inch wide, was found on the upper and outer side of the left lateral ventricle. There was purulent matter with surrounding redness in the substance of the *hippocampus major* on the left side. On the anterior and outer portion of the right cerebral hemisphere the *dura mater* was adherent and unusually red at one point the size of a sixpence, the surface of which was covered with purulent matter.

There was a diseased mass attached to the outer side of the cerebellum the size of a pigeon's egg. The membranes around very red, covered with purulent matter. In one part of this mass was a hard cancerous portion the size of a musket bullet.

*Chest*.—Pleuritic adhesions at the upper lobe of the left lung only, which lobe contained a cancerous tumour the size of a large orange, extending from the root of the lung ; there was softening of the centre of the tumour. Weight of the lung,  $21\frac{1}{2}$  ounces ; the right lung,  $11\frac{1}{2}$  ounces ; and the heart, 9 ounces.

*Abdomen*.—In the right lobe of the liver was a cancerous tumour the same size and soft in the centre as the one in the lung.

Weight of the liver, 49 ounces ; stomach,  $5\frac{1}{2}$  ounces ; spleen, 3 ounces ; pancreas, 3 ounces ; kidneys,  $7\frac{1}{2}$  ounces ; and renal capsules  $\frac{1}{2}$  ounce ; weight of the body, 77 pounds ; height, 5 feet 6 inches.

Mr Gulliver, by examination with the microscope, found the matter in the lung, liver, and cerebellum to be identical and of a cancerous nature.

Case 786. Char-woman, aged 70 years, widow. Cancer of the brain, lungs, left kidney, and left renal capsules, combined with hydatids in the liver.

Ten weeks a patient in the Infirmary ; she had incontinence of urine for three weeks before her admission ; urine alkaline, but contained no albumen. The aspect of the patient bore evidence of

her suffering from malignant disease. There was a hard circumscribed abdominal tumour to be felt nearly the size of a newly born child's head ; the bowels being either in a relaxed or confined state produced no effect on the size of the tumour. The body was examined twenty-one hours after death.

*Head.*—The *dura mater* was adherent to the anterior portion of the cerebral hemispheres ; the convolutions flattened ; in the anterior portion of the right hemisphere there was a firm round tumour, two inches in diameter, of a pink colour externally, yellowish green internally, and white at the centre, where it was softened. The portion of the left cerebral hemisphere anterior to the left lateral ventricle formed a brownish mass, attached to the membrane covering the roof of the left orbit by a dark root three-quarters of an inch in diameter. The brain immediately around the diseased mass was in a pulpy state ; the lateral ventricles contained about one ounce of clear fluid, which was found, both by heat and the addition of nitric acid, to contain albumen. The weight of the brain, 45½ ounces.

*Chest.*—Pleuritic adhesions on both sides ; the upper lobe left lung was firmly adherent to the second rib, which broke in the removal of the lung, being very brittle, as has been frequently observed in cancer. The superior third of the upper lobe of the left lung was occupied by a white scirrhous tumour : in the upper portion of the lower lobe there was a white tumour the size of a pigeon's egg, in a softened state ; and in the lower portion of the same lobe another tumour, about one-third the size, in a similar state. The right lung presented on the external and posterior surface four firm projecting cancerous tumours, the largest one about two inches in diameter.

A model of the lungs in wax was made by Mr Tuson, and preserved in the museum of University College.

The bronchial glands in the vicinity of the left apex were enlarged and cancerous. The right lung weighed 20½ ounces ; the left, 33 ounces ; and the heart, 9½ ounces.

*Abdomen.*—Liver large ; a white circle of chalky matter, the size of a tea-cup, which surrounded a mass of hydatids near the surface of the right lobe.

The liver weighed 57 ounces ; the stomach, 5 ounces ; the pancreas weighed 2½ ounces ; and the spleen, 12 ounces ; the right kidney enlarged, minute cells on the surface, weight, 8½ ounces. No trace of the left kidney, the situation occupied by a yellowish green cancerous mass, which weighed 33 ounces ; part of the capsule of the kidney found very much thickened, the part modelled and preserved with the lungs ; the left renal capsule occupied by a firm cancerous mass ; the right renal capsule weighed 2 drachms and 40 grains ; and the uterus, 1½ ounce. Weight of the body, 73 pounds ; height, 5 feet 5 inches.

*Remarks.*—The three cases of cancer occurred in persons of 50 years old and upwards. In the first one, the *dura mater* was



the seat of the disease, there was softening of the brain, and cysts were found in the liver.

In the second the cerebellum was the part affected, the *dura mater* was adherent, and there was pus in the brain; there was also cancer in the left lung and in the liver. Cancerous matter from the cerebellum, lung, and liver, was subjected to a microscopical examination by Mr Gulliver, and proved in all three to be identical; fatty molecules, either free or included as nuclei of the cancerous cells, were very abundant.

The third case, in the woman of 70, the cerebrum was affected with cancer, the *dura mater* adherent, and the brain around the cancerous mass in a pulpy state; the lateral ventricles contained albuminous fluid. Both lungs, the bronchial glands, the left kidney, and the renal capsules were affected with cancer. The liver contained hydatid cysts.

A model of the cancerous parts in wax by the late Mr Tuson, the modeller, has been preserved in the museum of University College, London.

*Duration of the disease.*—The slow progress of the disease was well exemplified in the first case; hemiplegia had existed for six months; the existence of the tumours was the only cause revealed for that unequivocal symptom. In the second case the illness was of twelve months' duration; and in the third of more than three months' duration.

*Symptoms.*—These are usually of gradual development, determined by the situation and size of the tumour, as well as by the direction in which the pressure is exercised, greater in proportion as it impinges on the centre and base of the brain; the sensibility of the skin is sometimes increased, sometimes diminished; and convulsions, paralysis, and stupor, are the usual accompaniments; acute inflammation, fluid in the ventricles, or most frequently softening of the surrounding portion of the brain, are the usual terminations. If the patient has been for a considerable time confined to the recumbent position in bed, pneumonia is a common result, in this as well as in other diseases attended with much debility. Under the head "*De Dolore Capitis, Anatomiae Practicae Boneti 1700, Lib. 1, Tom. 1, Obs. 67-71,*" Scirrhus tumours on membranes of brain, scirrhus pia mater. In the same vol. additamenta after page 77, *De Reliquis Affectibus Soporosis, &c., Obs. 20, Hardness of brain, Obs. 21, Scirrhus tumour. Morgagni, Book v., Let. lxii. a. 15, Scirrhus of cerebellum.*

The fact of cysts having been found in the liver in two out of the three cases of cancer, is worthy of observation. In two cases there were cancerous tumours in the lungs, and in other organs.

Cancerous tumours of the meninges are figured in pl. 1, 2, and

3, Liv. 8, *Anatomie Pathologique* by Cruveilhier, who divides them into two classes, external and internal; after combating the opinions of Louis and the brothers Wenzel, that the external layer of the *dura mater* was primarily affected; as well as the opinion that the bones of the cranium were the primary seat of the disease, which was supported by Siebold, Walther, and Graff, he agrees with Ebermaier, and divides them into external and internal, as before mentioned.

The external cancerous tumours, according to Cruveilhier, make their way through the bony parietes after the same manner as an aneurism; while the internal cancerous tumours, which are much the most common, increase in the opposite direction,—ultimately compress the brain and become imbedded in its structure, the *dura mater* at the same time having become thickened and adherent, which was particularly well marked in the first of the cases here related.

The second of the cases (No. 785) appeared to be one of those in which the cancerous tumour had its origin in the subarachnoid cellular tissue, which is not an unusual seat of the disease.

In the Supplement to Abercrombie on the Brain, edit. 3, p. 433, *et seq.* are to be found cases of scirrhus of the cerebrum and cerebellum, viz. cases 5, 11, 15, 32, and 38.

In Dr Walshe's Book on Cancer, London, 1846, from p. 487 to p. 523, will be found Abstracts of Cases of Cancer of the Brain and Membranes, from the writings of Andral, Calmeil, Broussais, Louis, Graff, &c.

Andral states, that the disease is one of slow formation, and occurs at all ages. Out of 45 cases, it occurred twice in infants of 2 years, once at 3, once at 4, once at 7, once at 11, once at 12, once at 14, once at 17, three times between 20 and 30, eight times from 30 to 40, eleven times from 40 to 50, nine times from 50 to 60, five times from 60 to 80. *Cours de Pathologie Interne*, 2d edit. Bruxelles, 1837.

#### TABLE IX. TUMOURS. (1 MALE AND 4 FEMALES.)

**Case 787.** A male, inmate of the workhouse, aged 33 years. Paralyzed for some years; died three days after his admission to the infirmary, very much emaciated; he had hemiplegia of the left side, and passed his motions involuntarily.

**Head.**—On the posterior portion of the right cerebral hemisphere there was a tumour which weighed 6 ounces; there was also a small tumour which weighed  $\frac{1}{2}$  ounce, on the opposite side, in the left cerebral hemisphere; weight of the brain 45 ounces.

**Chest.**—The organs natural; weight of both lungs 30 ounces.

**Abdomen.**—The liver weighed 58 $\frac{3}{4}$  ounces; stomach 4 $\frac{1}{4}$  ounces; spleen 3 $\frac{3}{4}$  ounces. Weight of the body 75 pounds; height 5 feet 6 inches.

Case 788. A prostitute, aged 26 years. Tumours of the *dura mater*, complicated with softening of the right cerebral hemisphere.

Admitted to the infirmary six days before her death, in a state of stupor, attended with syncope; pulse feeble; pain in the head; pupils dilated. She died in convulsions, similar to apoplexy; there was no paralysis.

*Head*.—The *dura mater* was firmly adherent to the upper and posterior portion of the right cerebral hemisphere, and had three tumours attached to the under surface, occupying about three inches in circumference of that membrane, and imbedded in the structure of the brain to the depth of half an inch. The brain around the tumours softened, of a smooth white appearance like thick cream. Weight of the brain  $47\frac{1}{2}$  ounces.

*Chest*.—The viscera healthy; weight of both lungs  $25\frac{1}{2}$  ounces; heart  $8\frac{1}{4}$  ounces.

*Abdomen*.—The peritoneum adherent to the convex surface of the liver by several small points. The liver weighed 46 ounces; spleen  $5\frac{1}{2}$  ounces; stomach  $5\frac{1}{2}$  ounces; pancreas  $2\frac{1}{4}$  ounces. The right kidney wasted, weight  $2\frac{1}{2}$  ounces; the left kidney enlarged, weight  $5\frac{1}{2}$  ounces; the uterus  $2\frac{1}{2}$  ounces; the lining membrane unusually red. Height 5 feet 3 inches.

Case 789. A female, aged 49 years. Tumour on the *dura mater*, complicated with a granular state of the great omentum. The body brought for burial; nothing known of the case during life.

*Head*.—Congestion of the brain; a small tumour, size of a pistol bullet, attached to the under surface of the *dura mater*; there was a corresponding indentation on the surface of the brain. Weight of the brain  $40\frac{1}{2}$  ounces.

*Chest*.—Slight pleuritic adhesions of the upper lobes of the lungs; earthy matter in the apices, and a puckered state of the pleura, probably the result of small tuberculous cavities which had healed and closed up. Weight of both lungs  $25\frac{1}{2}$  ounces; the heart 7 ounces.

*Abdomen*.—A hand-breadth of the great omentum nearly covered with patches of granular-looking white matter, from the size of a horse bean to that of a split pea, probably albuminous matter by endosmose, presenting, according to Mr Gulliver, an amorphous appearance under the microscope.

The great omentum was unusually loaded with fat, and extended into the pelvis.

The liver weighed  $36\frac{1}{2}$  ounces; the stomach  $5\frac{1}{2}$  ounces; the pancreas  $2\frac{1}{2}$  ounces; the spleen unusually small, 1 ounce in weight. Both kidneys weighed  $7\frac{1}{4}$  ounces, and the uterus  $1\frac{1}{2}$  ounce. Weight of the body 71 pounds; height 5 feet 4 inches.

Case 790. A charwoman, aged 59 years. Tumours of the falx and tentorium imbedded in the cerebral hemispheres, with softening of the brain, combined with pulmonary phthisis, jaundice, and softening of the liver. More than ten weeks a patient in the infirmary, and ill four weeks previous to being admitted.

At intervals during her illness she became insensible for a time and then rallied again; towards the end, these attacks of insensibility became of longer continuance, and the urine and fæces were passed involuntarily. Hemiplegia of the right side came on one month before death. The body was examined 39 hours after death.

*Head.*—There was softening of the centre of both cerebral hemispheres, in which were found two tumours, one on each side, adherent to the falx and to the tentorium below, imbedded in the substance of the hemispheres; the largest of the tumours was the size of an orange, and on the left side; the tumours when divided appeared like melanoid matter mixed with fibrous, and were in one part yellow, and in another reddish. Weight of the brain  $47\frac{1}{4}$  ounces.

*Chest.*—The right lung only adherent to the parietes; the pleura thickened over the apex, and a tuberculous cavity beneath; a portion of the lower lobe of the same lung in the second stage of pneumonia; weight,  $19\frac{1}{2}$  ounces. The left lung natural; weight,  $12\frac{1}{2}$  ounces; the heart 8 ounces.

*Abdomen.*—The fat of a golden-yellow colour; the liver softened, weight, 42 ounces; the stomach  $5\frac{1}{2}$  ounces; the spleen  $3\frac{1}{2}$  ounces; the pancreas  $2\frac{1}{2}$  ounces; the uterus  $1\frac{1}{2}$  ounce; the kidneys congested, weight,  $8\frac{1}{2}$  ounces. Weight of the body 73 pounds; height 5 feet.

Case 791. A female, aged 60 years. A tumour on the membranes of the brain, and an increased quantity of fluid in the ventricles. She died in a chronic ward in the workhouse, in a fatuous state. Occasionally she suffered from pain in the head and face, and twitchings of the muscles of the face. She had also been subject to convulsions.

*Head.*—The lateral ventricles of the brain contained about two ounces of fluid. Adherent to the *dura mater*, on the right side of the *sella turcica*, was a tumour the size of an almond, of a reddish colour, and firm fibrous structure. Weight of the brain 37 ounces.

*Chest.*—The upper lobes of the lungs emphysematous; the lower lobe of the left lung slightly congested; the right lung weighed  $12\frac{1}{2}$  ounces; the left  $13\frac{1}{2}$  ounces; the heart fatty and enlarged, weight, 14 ounces.

*Abdomen.*—The intestines not opened. A fibrous tumour, the size of musket bullet, attached to the fundus of the uterus; weight of the uterus 2 ounces. The other viscera healthy. Weight of the liver 41 ounces; stomach  $4\frac{1}{2}$  ounces; spleen 3 ounces; pancreas  $2\frac{1}{2}$  ounces; kidneys  $6\frac{1}{2}$  ounces, and the renal capsules  $\frac{1}{2}$  ounce. Weight of the body 88 pounds; height 5 feet 4 inches.

*Remarks.*—In the young man's case, the tumour in the right cerebral hemisphere was as large as an orange; hemiplegia of the left side had existed for some years, from which it is probable the tumour was of very slow growth.

Perforating tumours of the cranium have been known to be of

very long duration; one by Graff of 87 years, and another by Louis of 40 years' standing.

In the four females, the membranes were firmly adherent to the tumours; very probably had their origin in the membranes, as has been frequently observed: Hooper's Morbid Anatomy of the Brain, plate 6 and 7. In the Supplement to Abercrombie on the Brain, p. 435, *et seq.* are several cases, including firm, soft, chalky, cheesy, fatty, spongy, reddish tumours, of various sizes in different parts of the brain: Also hydatids, and in Hooper's Morbid Anatomy, pl. 10 and 18. In the Dict. de Med., Tom. xi. p. 470, 482, various tumours of brain and membranes are treated of; and in Dr Copland's Dictionary of Practical Medicine, part 1, p. 207, 223-25. Cruveilhier, Anat. Pathol., 2d Liv. p. 6. Boneti, Anatomis, Lib. i. Tom. i., Observ. 56, 61, to 64, 70, additamenta, de Phrenitide, &c. Ob. 7, 35, p. 379, additam. Ob. 3.

#### TABLE X. SANGUINEOUS APOPLEXY. (15 MALES.)

Case 792. A male infant, aged 2 days. No history; brought from out of doors previous to being buried. The infant well formed, but very small.

*Head.*—The brain firm, the convolutions rather flattened. Each lateral ventricle contained a clot of blood, which weighed half a drachm. There was also some blood effused on the base of the brain. Weight of the brain 9 ounces.

*Chest.*—The lungs floated in water, but were not fully distended with air. The right lung weighed  $\frac{3}{4}$  ounce; the left  $\frac{3}{4}$  ounce; the heart 2 drachms.

*Abdomen.*—The organs natural. Weight of the liver 3 ounces; spleen 70 grains; stomach 80 grains; pancreas 20 grains; thymus 90 grains; kidneys  $\frac{1}{2}$  ounce; and renal capsules  $1\frac{1}{4}$  drachm. The body weighed  $3\frac{1}{2}$  pounds; length 17 inches.

Case 793. A male infant, aged 13 days. From the lying-inward of the Infirmary. Apoplexy, with congestion of the right lung. The infant was convulsed for three days before death, unable to suck; it died in a fit. There was considerable emaciation of the body; the loss of weight amounted to 2 pounds 7 ounces in thirteen days. After birth it weighed 7 pounds.

*Head.*—The veins of the brain congested; the interior of the lateral ventricles of a purple colour from blood, to the depth of one eighth of an inch. Weight of the brain nearly  $13\frac{1}{4}$  ounces.

*Chest.*—The posterior portion of the right lung congested; aggregation corpuscles in the lung; weight 1 ounce; the left lung  $\frac{3}{4}$  ounce; the heart, 3 drachms.

*Abdomen.*—The liver dark-coloured, weight  $2\frac{1}{2}$  ounces; the stomach 80 grains; the spleen 80 grains; the pancreas 2 drachms; the thymus 2 drachms; the kidneys  $\frac{3}{4}$  ounce; and the renal capsules 2 scruples. Weight of the body 4 pounds 9 ounces; length 18 inches.

Case 794. A horse-dealer, aged 28 years, single. Apoplexy and

hemiplegia of the right side, combined with hydrocephalus, enlarged heart, and enlarged kidneys with cysts.

Upwards of twelve months before his death he had a fit of apoplexy, attended with paralysis and loss of speech, for which he was some time a patient in the London Hospital; from thence he was sent to this infirmary, where he remained for two months. During the time he was in the infirmary he recovered his speech, but was quite childish. Ultimately he was transferred to a chronic ward in the workhouse. Convulsions occurred occasionally, but were of short duration; in the intervals his health was tolerable; his appetite good. While in the workhouse he was in the habit of passing a large quantity of urine. Death occurred from a second attack of apoplexy.

*Head.*—The convolutions of the brain flattened; the lateral ventricles contained upwards of four ounces of fluid, and the anterior portion of each ventricle was occupied by a clot of blood more than one ounce in weight, which extended through the dilated foramen of Monro, and filled the third and fourth ventricles, descending between the restiform bodies as low down as the *medulla spinalis*. The structure of the brain around the clot was broken up. Beneath the smooth surface of the right *corpus striatum* and *optic thalamus*, was an appearance like a cicatrix, with\* rusty-coloured matter in the centre; the brain around preternaturally hardened. This appearance was most probably from the first attack of apoplexy. At the lower and posterior portion of the left *corpus striatum*, there was a much smaller rusty discoloration the size of a split pea. Weight of the brain 44½ ounces. The processes more pointed than usual on either side the *foramen magnum*.

*Chest.*—The lower lobes of both lungs congested, the bronchial lining of a bright red colour; the right lung weighed 28 ounces; the left 26 ounces. There was enlargement and thickening of the left ventricle of the heart, so that the right appeared like a mere appendix. Weight of the heart 16 ounces.

*Abdomen.*—The cæcum, transverse arch, and sigmoid flexure of the colon distended with air; the rectum contracted. The stomach enlarged, weight 6 ounces; the liver large, 53½ ounces; the spleen 3½ ounces; pancreas 4 ounces. The kidneys were about four times their natural size, and appeared like two large bunches of grapes, their surfaces studded with numerous cysts, filled with different coloured fluids, almost black in some and quite clear in others, with all the intermediate shades of colour. The right kidney weighed 19½ ounces; the left 21½ ounces; the renal capsules 1 ounce. Weight of the body 115 pounds; height 5 feet 8 inches.

Case 795. A painter, aged 32 years. Apoplexy, sudden death in a privy. A coroner's inquest was held. The body was brought to the infirmary after the inquest. Decomposition had commenced previous to the examination. The man had been a patient in the infirmary frequently, on account of epileptic fits, to which he had been subject for many years. He was of a full habit.

\* Dr Davy found the colouring matter in similar cases to be peroxide of iron, vid. Edin. Med. and Surg. Journal, vol. lx. p. 159.

*Head*.—The veins of the brain congested. There was a clot of blood, two inches in diameter, in the posterior portion of the right cerebral hemisphere. In the posterior portion of the left cerebral hemisphere, above the lateral ventricle, was a cavity, equal to the circumference of a shilling, filled with fluid contained in cells; weight of the brain  $50\frac{1}{4}$  ounces.

*Chest*.—The viscera appeared natural. The right lung weighed  $20\frac{1}{2}$  ounces; the left 20 ounces; and the heart 12 ounces.

*Abdomen*.—The liver weighed 50 ounces; the stomach  $5\frac{1}{2}$  ounces; the spleen  $7\frac{1}{2}$  ounces; the pancreas 2 ounces; the kidneys small,  $7\frac{1}{2}$  ounces. Weight of the body 119 pounds; height 5 feet 9 inches.

Case 796. A dwarf, aged 33 years. Apoplexy, combined with an unusually small *foramen magnum*. Sudden death, and coroner's inquest. His father and sister both of low stature. He was passionate and addicted to drink. While engaged in his usual occupation of driving a chaise, he fell out in a fit, and was carried into a chemist's shop. He complained of "a singing in his head." He recovered sufficiently to drive off again for a short distance, when he had a second fit, in which he died. The body was brought by the police to the infirmary.

*Head*.—In the anterior portion of the *dura mater*, on the left side, there was a thin crust of bony matter, the size of half-a-crown. On the surface of the cerebral hemispheres was a clot of blood, which weighed eight ounces.

The *foramen magnum* would scarcely admit the point of the little finger. There appeared to be constriction of the *medulla oblongata*, and old adhesions of the arachnoid opposite the basilar process. The spinal canal and spinal marrow below this point were found to be natural.

The brain was large. The cerebrum weighed  $45\frac{1}{2}$  ounces; the cerebellum  $4\frac{1}{2}$  ounces. The *medulla oblongata* small,  $\frac{1}{2}$  ounce, which is about half the usual weight.

The skull around the forehead measured  $23\frac{1}{2}$  inches; inside, from *torcular Herophili* to *crista galli*, 6 inches; across, from temple to temple inside, 5 inches. The *foramen magnum* measured  $\frac{1}{2}$  inch from before backwards, and 1 inch from side to side. The length of the spine was 28 inches.

*Chest*.— $33\frac{1}{2}$  inches in circumference below the arm pits and just above the nipples. There was a considerable thickness of fat over the muscles; the cartilages flexible and easily cut with a scalpel; the viscera healthy. Weight of the right lung 13 ounces; the left  $12\frac{1}{4}$  ounces; and the heart 10 ounces. The arch of the aorta, as well as the descending portion of that vessel, and the iliac arteries, were smaller than usual. The *arteria innominata* was of the usual size.

*Abdomen*.— $33\frac{1}{2}$  inches in circumference; the bladder distended; the viscera in a healthy state; weight of the liver 58 ounces; the spleen  $5\frac{1}{2}$  ounces; the stomach 7 ounces; the pancreas 4 ounces; the kidneys  $10\frac{1}{2}$  ounces; the capsules  $\frac{3}{4}$  ounce. Weight of the body 113 pounds; height 4 feet 2 inches.

The extremities were rickety ; the forearms slightly flexed ; the finger ends could only reach the crest of the ilium.

The thigh was 22 inches in circumference. From the crest of the ilium, down the thigh and leg, to the under part of the instep, measured 23 inches. The foot was 8 inches long.

**Case 797.** A male, aged 37 years. Apoplexy, combined with enlargement of the heart. No history of the case ; had been bled ; brought from out doors before being buried.

**Head.**—Congestion of the cerebral veins ; flattening of the convolutions ; the brain pale and rather soft ; about one ounce of bloody serum in the lateral ventricles, and a clot of blood in the right, which weighed  $1\frac{1}{2}$  ounce ; the structure of the brain around the clot broken up (eroded) ; weight of the brain  $45\frac{1}{2}$  ounces.

**Chest.**—Lungs natural ; the right weighed 16 ounces ; the left  $14\frac{1}{2}$  ounces. The heart enlarged, the left ventricle having its parietes greatly thickened ; weight 17 ounces.

**Abdomen.**—Weight of the liver 51 ounces ; the spleen 3 ounces ; the stomach  $6\frac{1}{2}$  ounces ; the pancreas  $3\frac{1}{2}$  ounces ; the kidneys small,  $6\frac{1}{2}$  ounces ; the renal capsules  $\frac{1}{2}$  ounce. Weight of the body 114 pounds ; height 5 feet 6 inches.

**Case 798.** A male from the workhouse, aged 52 years. Sudden death. Apoplexy, combined with chronic arachnitis, and distension of the lateral ventricles with fluid.

**Head.**—Opacity of the arachnoid. There was flattening of the convolutions. The lateral ventricles contained between five and six ounces of fluid. A clot of blood, one drachm in weight, presented itself at the foramen of Monro, and filled the third and fourth ventricles. The *corpora striata* appeared wasted ; not so full or so firm as natural.

The medulla was slightly permeated by blood at the origin of the pneumogastric nerves ; weight of the brain  $48\frac{3}{4}$  ounces.

**Chest.**—The right lung weighed  $16\frac{1}{2}$  ounces ; the left lung congested, weighed  $26\frac{3}{4}$  ounces ; the heart enlarged, 17 ounces.

**Abdomen.**—Liver enlarged, weight 60 ounces ; the spleen  $5\frac{3}{4}$  ounces ; the stomach  $6\frac{3}{4}$  ounces ; the pancreas  $2\frac{3}{4}$  ounces ; the kidneys enlarged,  $13\frac{1}{4}$  ounces ; fatty omentum. Weight of the body 137 pounds ; height 5 feet 9 inches.

**Case 799.** A coachman, aged 61 years, for some time in the workhouse. Apoplexy, combined with emphysema, and enlargement of the heart. He was seized suddenly in a fit, and became insensible. He was brought directly to the infirmary, and was bled to 26 ounces. The pulse, from being full and bounding, fell suddenly after the bleeding, but very soon recovered itself, and remained regular for several hours. The insensibility, however, remained, and death occurred the day after.

**Head.**—The cerebral convolutions flattened ; the structure of the brain unusually pale ; more than three ounces of clotted blood in the lateral ventricles and the third and fourth ventricles ; the surrounding portion of brain eroded. The arteries of the brain



contained a number of white specks in their coats, partly of bony matter ; weight of the brain 42 ounces.

*Chest*.—Emphysema of the lungs, and redness of the bronchial lining membrane ; no pleuritic adhesions. The right lung had an unusually large quantity of blood in the lower lobe, probably cadaveric congestion, the weight 24 ounces ; the left lung 15 ounces ; the heart enormously enlarged, weight  $29\frac{1}{2}$  ounces ; osseous matter in the aorta in the form of plates, rendering the internal coat quite rough.

*Abdomen*.—The intestines not opened. The liver weighed  $51\frac{1}{2}$  ounces ; the spleen  $6\frac{1}{2}$  ounces ; the stomach 8 ounces ; the pancreas 5 ounces ; the kidneys 9 ounces ; and the renal capsules  $\frac{1}{2}$  ounce. Weight of the body 188 pounds ; height 5 feet 6 inches.

Case 800. An undertaker's assistant, aged 63 years. Apoplexy, hemiplegia and bronchitis, enlargement of the heart, fractured ribs, and inguinal hernia.

Employed in the workhouse for some years as an undertaker. Admitted to the infirmary eleven days before his death, with fracture of the tenth and eleventh ribs of the left side, near their centre, from a fall. The right side was slightly paralysed, from a fit, four weeks before his death ; the memory not affected.

*Head*.—A clot of blood one inch long and three-fourths of an inch broad in the right *corpus striatum*. Weight of the brain,  $48\frac{1}{2}$  ounces.

*Chest*.—Old pleuritic adhesions of both lungs ; congestion of the lower lobes of both lungs ; redness and thickening of the bronchial lining membrane. Each lung weighed  $26\frac{1}{2}$  ounces. The heart enlarged ; weight  $15\frac{1}{2}$  ounces.

*Abdomen*.—An irreducible scrotal hernia on the right side ; the cæcum was contained in the scrotum, and could not be drawn entirely out, from adhesions which had formed. The liver weighed  $48\frac{1}{2}$  ounces ; the spleen 4 ounces ; the stomach  $5\frac{1}{2}$  ounces ; the pancreas 2 ounces ; the kidneys  $10\frac{1}{2}$  ounces ; the renal capsules  $\frac{1}{2}$  ounce. Weight of the body 110 pounds ; height 5 feet 7 inches.

Case 801. A miller, aged 65 years. Apoplexy, combined with enlarged heart and diseased cerebral arteries. Coroner's inquest. The body was found, and life extinct, some distance from the Great Western Railway Station, in going to which it was supposed that he had missed his way. It was discovered that money had been taken from his person, in consequence of which the inquest was adjourned until after a *post mortem* examination was made, forty-two hours after the body was found.

There were no marks of violence on the body, which was exceedingly fat. The back and the neck discoloured from the gravitation of the blood.

*Head*.—The *dura mater* was firmly adherent to the skull-cap, and was torn by the removal of it, and more than a pint of dark fluid blood escaped ; there was about one quarter of a pint of blood beneath the cerebral hemispheres on the tentorium ; the vessels of

the brain contained, besides, the ordinary quantity of blood. The arteries had thick fibrous and osseous specks in their coats. Weight of the brain  $41\frac{1}{2}$  ounces.

*Chest.*—About three ounces of fluid in each pleura; congestion of the lower lobe of the left lung, probably cadaveric; redness of the bronchial lining membrane of both lungs; the right lung weighed 19 ounces; the left 26 ounces. The heart very much enlarged; the walls of the left ventricle greatly thickened; weight of the heart  $21\frac{1}{2}$  ounces.

*Abdomen.*—The mouth clean, and the teeth very good at such an age; the œsophagus lined with a white pulpy substance, which ended abruptly at the cardia; when this was scraped off, the mucous membrane appeared to be quite healthy. The stomach contained about 23 ounces of masticated potato and bread, and had an odour of sherry wine, of which he had taken half-a-pint at dinner. There was a uniform redness of the mucous membrane of the stomach; the vessels appeared full of blood, but not congested. Weight of the stomach  $8\frac{1}{2}$  ounces.

The duodenum was full of chyle; the mucous membrane of the intestines healthy. The liver weighed 53 ounces; the spleen  $7\frac{1}{2}$  ounces; the pancreas  $2\frac{1}{2}$  ounces. A cyst filled with fluid in the right kidney; the kidneys weighed  $9\frac{1}{2}$  ounces, and the renal capsules 1 ounce. Weight of the body 155 pounds; height 5 feet 10 inches.

Case 802. A male, aged 65 years. Apoplexy, combined with enlarged heart. Admitted to the infirmary the day before his death; subject to vertigo and convulsions occasionally for a considerable period; in a fatuous state. Had the character of being a large eater.

*Head.*—An apoplectic clot of some standing, the size of half-a-crown, in the posterior portion of the right cerebral hemisphere, close to the outer wall of the lateral ventricle. Weight of the brain  $46\frac{1}{2}$  ounces.

*Chest.*—Congestion of the lower lobes of both lungs, probably cadaveric. The right lung weighed 26 ounces; the left 22 ounces. General enlargement of the heart; weight 21 ounces.

*Abdomen.*—The viscera natural. Weight of the liver 50 ounces; the spleen 3 ounces; the stomach  $5\frac{3}{4}$  ounces; the kidneys 7 ounces. Weight of the body 107 pounds; height 5 feet 6 inches.

Case 803. A chairmaker, aged 72 years. Apoplexy and softening of the cerebellum, combined with opacity of the arachnoid, fluid in the lateral ventricles, and enlargement of the heart.

This person was brought to the infirmary by the police from the Regent's Park, where he had thrown himself into the water. On admission, he was suffering from cold and wet, from which he soon recovered; his immersion in the water had been for about two minutes. The second day after his admission he became convulsed, and died in one quarter of an hour afterwards. The body was examined four days after death.

*Head.*—There was opacity of the arachnoid; the lateral ventricles were distended, and contained about three ounces of clear fluid;

the cerebral structure firm ; the cerebellum unusually soft ; the left lobe and centre infiltrated with blood. Weight of the brain  $48\frac{1}{2}$  ounces.

*Chest*.—The lungs congested, especially the right, which weighed 41 ounces ; the left 35 ounces. The heart enlarged ; weight 13 ounces.

*Abdomen*.—The intestines not examined. Weight of the liver 57 ounces ; the spleen 4 ounces ; the stomach 6 ounces ; the pancreas 3 ounces ; the kidneys 8 ounces ; and the renal capsules  $\frac{3}{4}$  ounce. Weight of the body 115 pounds ; height 5 feet 9 inches.

Case 804. Male, aged 73 years. Apoplexy. This case occurred out of doors. The man died suddenly ; he got out of bed, fell on the floor, and never spoke afterwards—in a state of complete coma.

*Head*.—The cerebral convolutions flattened, most so posteriorly ; a large clot of blood in the left hemisphere ; the surrounding substance eroded ; both the lateral ventricles, as well as the third and fourth, filled with blood ; the *septum lucidum* destroyed. Weight of the brain  $42\frac{3}{4}$  ounces.

*Chest*.—Slight pleuritic adhesions at the apex of the right lung, which contained earthy matter ; cadaveric congestion of the posterior lobes of both lungs. The right lung weighed  $23\frac{1}{2}$  ounces ; the left  $25\frac{1}{2}$  ounces ; the heart 12 ounces.

*Abdomen*.—The liver weighed  $43\frac{3}{4}$  ounces ; the spleen  $3\frac{3}{4}$  ounces ; the stomach  $4\frac{1}{2}$  ounces ; the pancreas  $2\frac{1}{2}$  ounces ; the kidneys  $8\frac{1}{2}$  ounces ; and the renal capsules 6 drachms and 1 scruple. Weight of the body 105 pounds ; height 5 feet 9 inches.

Case 805. Male, from chronic ward, workhouse, aged 76 years. Apoplexy, combined with asthma and enlargement of the heart. Sudden death,—a coroner's inquest in consequence. Death occurred within half-an-hour of the first seizure.

*Head*.—The *dura mater* firmly adherent to the skull-cap ; about one pint and a-half of fluid blood escaped when the latter was removed. There was blood on the tentorium and on the posterior portion of the cerebral hemispheres ; no blood extravasated in the substance of the brain. Weight of the brain 43 ounces.

*Chest*.—Emphysema of the lungs, and redness of the bronchial lining membrane ; no pleuritic adhesions. Oedema of the posterior portions of both lungs, especially of the right ; frothy ; a considerable quantity of fluid escaped from the divided surface. The pleura contained half-a-pint of fluid. Weight of the right lung, 36 ounces ; the left 30 ounces ; and the heart 18 ounces. The aortic sigmoid valves contained osseous matter, as well as the aorta, which was quite rough in many places on the inner surface from that cause.

*Abdomen*.—A quantity of fat about the intestines, in the omentum, and around the kidneys. Weight of the liver, 54 ounces ; the stomach  $8\frac{1}{2}$  ounces ; the pancreas 6 ounces ; the spleen  $5\frac{1}{2}$  ounces ; the kidneys 10 ounces ; and the renal capsules  $\frac{3}{4}$  ounce. A portion

of the capsules of spleen cartilaginous ; body warm, although dead twelve hours ; the weight 105 pounds ; height 5 feet 5 inches.

Case 806. Male, aged 79 years. Apoplexy, combined with softening of the brain, pneumonia, and bronchitis. In a state of stupor and speechless on admission to the infirmary. He remained in a comatose state for nearly the whole time, (eight days,) when he died ; at one period after admission there was jactitation of the arms, and picking at the bed-clothes and wall.

*Head.*—A bony spiculum at the posterior portion of the longitudinal sinus ; there was a clot of fibrine the size of a filbert in the left *corpus striatum* ; the brain around was softened. Weight of the brain 38 ounces.

*Chest.*—Some calcareous matter in the apex of the right lung ; the lower lobe in the third stage of pneumonia, infiltrated with dark-coloured fluid ; the structure soft. The bronchial lining membrane of both lungs thickened and red. The right lung weighed 15½ ounces ; the left 13 ounces ; and the heart 8½ ounces.

*Abdomen.*—The organs wasted. Weight of the liver 27 ounces ; the spleen 2½ ounces ; the stomach 5½ ounces ; the pancreas 1½ ounce ; the kidneys 5½ ounces ; and the renal capsules ½ ounce. Weight of the body 81 pounds ; height 5 feet 6 inches.

#### TABLE X. SANGUINEOUS APOPLEXY. 15 FEMALES.

Case 807. A servant, aged 32 years, single. Apoplexy, combined with softening of the brain and enlargement of the heart. Seven days a patient in the infirmary. While in a situation as a servant, three weeks before admission, she fell in a fit and became speechless ; her speech soon returned, and she resumed her work the day following, and seemed as well as usual for a week, when she had a second fit, and again lost her speech. The second fit only continued for about half an hour, a much shorter time than the first ; she was unable, however, to resume her work, and lived with her sister for one fortnight, and was then admitted to the infirmary. There was no paralysis on admission ; the symptoms were those of low fever ; pulse weak ; tongue foul but moist ; pain in head, back, and stomach.

On the second or third day after admission, she complained at times of seeing the light at night in the ward double, and she felt a weakness in the right arm and leg. She was quite able to assist herself and to sit up until the evening before her death. Early in the morning she was seized with slight convulsions, became insensible, and died in an hour and a-half. The right arm and leg were quite warm, and the left arm and leg quite cold an hour after death, all the parts being covered alike with clothes.

Examination of the body 32 hours after death.

*Head.*—The arachnoid membrane dry ; the cerebral convolutions flattened, more especially on the left side. In the right hemisphere, external to the lateral ventricle, were two clots of blood, one the size of a pigeon's egg, of a yellow colour on the surface, the centre

parts dark-coloured ; nearer to the surface of the hemisphere, a second and smaller clot of blood, which appeared to be quite recently effused.

The structure of the brain around the clots was of a yellowish colour, pulpy, and free from red blood. The central portions of the brain, *corpora striata*, and *optic thalami*, quite healthy. Weight of the brain 42½ ounces.

*Chest*.—Redness of the bronchial lining membrane ; the right lung weighed 19½ ounces ; the left 16 ounces. Heart enlarged, weight 12½ ounces.

*Abdomen*.—The liver enlarged, weight 62½ ounces. The left kidney much larger than the right ; the one 3, and the other 5½ ounces. The supra-renal capsules weighed ¾ ounce. A small cyst in the right ovary. Weight of the uterus 2 ounces and 2 drachms ; the spleen 6½ ounces ; the pancreas 3½ ounces ; the stomach 6½ ounces. The mucous membrane of the intestines natural. Weight of the body 110 pounds ; height 5 feet 3 inches.

Case 808. A female, aged 34 years. Apoplexy, combined with hemiplegia of the opposite side. She was insensible when admitted to the infirmary, and died two days afterwards. One pupil was dilated, the other was contracted. Hemiplegia of the right side. A coroner's inquest was held on the body. It appeared in evidence that she had been drinking. The body was examined three days after death.

*Head*.—There was congestion of the right cerebral hemisphere ; the left hemisphere was unusually pale, and contained a clot of blood ; the lateral ventricle of the same side was filled with blood, as well as the third and fourth ventricles. Weight of the brain, 42½ ounces.

*Chest*.—Cadaveric congestion of the lower lobes of both lungs, and redness of the bronchial lining membrane. The right lung weighed 19 ounces ; the left 18 ounces ; and the heart 9 ounces.

*Abdomen*.—A digital elongation 3½ inches from the jejunum ; the liver large and soft, of a clay colour, weight 65 ounces. The right kidney enlarged, weight 6 ounces ; the left kidney wasted, weight 1 ounce ; the renal capsules ¾ ounce ; the spleen 3 ounces ; the stomach 5½ ounces ; the pancreas 3½ ounces ; and the uterus 2 ounces. Weight of the body 94 pounds ; height 5 feet 2 inches.

Case 809. A female, aged 50 years. Apoplexy combined with hemiplegia of the right side. She died in the infirmary six days after admission. The body was examined the day after death.

*Head*.—Two clots of dark-coloured blood, each the size of a nutmeg, in the left cerebral hemisphere, just above the centre of the left lateral ventricle. There was softening of the brain around the clots. An old cicatrix was observed on the surface of the left hemisphere, and an unusually large quantity of fluid. Weight of the brain 41½ ounces.

*Chest*.—Viscera healthy. The right lung weighed 16 ounces ; the left 12½ ounces ; and the heart 9 ounces.

*Abdomen*.—The intestines not examined ; the other viscera free

from disease. The liver weighed 28 ounces; the spleen  $3\frac{1}{4}$  ounces; the stomach  $4\frac{1}{2}$  ounces; the pancreas 2 ounces; the kidneys  $5\frac{1}{2}$  ounces; and the uterus 2 ounces. Weight of the body 60 pounds; height 4 feet 10 inches.

Case 810. A female, aged 50 years. Apoplexy, combined with enlargement of the heart. The body was brought from out of doors into the infirmary previous to interment. There was no history of the case.

The brain weighed 46 ounces.

*Chest.*—The lungs healthy. The right lung weighed 17 ounces; the left 18 ounces; heart enlarged,  $14\frac{1}{2}$  ounces.

*Abdomen.*—The viscera healthy. The liver weighed 44 ounces; spleen 5 ounces; the stomach 6 ounces; the pancreas 3 ounces; the kidneys 8 ounces; the uterus  $1\frac{1}{2}$  ounce; and the renal capsules 2 drachms. Weight of the body 83 pounds; height 5 feet 3 inches.

Case 811. A laundress, aged 50 years. Apoplexy, combined with a tumour on the "*dura mater*," and hemiplegia on the right side. Two days before her admission to the infirmary she was seized with a fit. About half an hour before the seizure she complained of giddiness. She became comatose soon afterwards, from which state she never recovered, and died the day after her admission.

Previous to this she had two attacks of apoplexy, the first one two years before, attended with hemiplegia of the right side. For several years she had been subject to convulsions, frequent flushings of the face, and pain in the head.

*Brain.*—The right cerebral hemisphere obviously larger than the left; the convolutions flattened; the arachnoid preternaturally dry. The right lateral ventricle contained a large clot of blood, which was found to extend beneath the right "*corpus striatum*." There was an oblong cyst, with rusty-coloured walls nearly an inch long, in the left *corpus striatum*. (This was probably the remains of the first apoplectic attack, as well as the cause of the hemiplegia.)

A tumour, the size of a walnut, was attached to the *dura mater* on the outer side, above the centre of the cerebral hemisphere. There was a corresponding depression or cavity for this tumour in the convolutions beneath. Weight of the brain  $42\frac{1}{4}$  ounces.

*Chest.*—Slight bronchitis. The right lung weighed  $15\frac{1}{2}$  ounces; the left  $16\frac{1}{2}$  ounces; the heart  $10\frac{1}{2}$  ounces, the left side thickened.

*Abdomen.*—Old peritoneal attachments between the intestines, liver, and diaphragm. Weight of the liver  $39\frac{1}{4}$  ounces; the spleen  $4\frac{3}{4}$  ounces; the stomach  $5\frac{1}{2}$  ounces; the pancreas 2 ounces; the uterus  $\frac{3}{4}$  ounce; the kidneys 8 ounces; and the renal capsules  $\frac{1}{2}$  ounce. Weight of the body 95 pounds; height 5 feet  $5\frac{1}{2}$  inches.

Case 812. A female, aged 55 years. Apoplexy, hemiplegia of the right side, and enlargement of the heart. Seized with apoplexy in the workhouse three-quarters of an hour before admission to the infirmary. Face flushed; speech faltering; slight delirium; head-ach; bowels confined for two days. The patient was of a full habit, and subject to vertigo for the last ten or twelve months. The

symptoms were relieved by cupping, and she lived seven weeks after her admission.

*Head*.—A brownish-coloured clot of blood, the size of a ripe cherry, found in the upper and back part of the left *corpus striatum* and adjoining portion of the *optic thalamus*. The surrounding portion of brain softened. The interior of the clot was of a darker colour than the exterior. Weight of the brain 41 ounces.

*Chest*.—Slight cadaveric congestion of the lower lobe right lung, and redness of the bronchial lining membrane. The right lung weighed 19½ ounces; the left 14½ ounces; the heart enlarged, 13½ ounces.

*Abdomen*.—The intestines semitransparent; the mucous membrane healthy. The liver weighed 45 ounces; the spleen 3 ounces; the stomach 4½ ounces; the pancreas 3 ounces; the uterus 1½ ounce; the kidneys 7 ounces; and the renal capsules ½ ounce. Weight of the body 84 pounds; height 5 feet 2 inches.

Case 813. A female, aged 57 years. Apoplexy combined with cysts in the choroid plexus, &c., and renal calculi. She was admitted from the workhouse, and died the same day in the infirmary. A period of eight hours elapsed between the first symptoms and the stage of insensibility; no convulsions.

*Head*.—A large clot of blood, the size of an orange, in the upper portion of the right cerebral hemisphere; both lateral ventricles were also filled with blood, as well as the third and fourth ventricles.

The choroid plexus contained several cysts filled with fluid, some as large as a pea.

*Chest*.—Slight congestion of the lungs, which weighed, together, 42 ounces. The thyroid body contained cysts. Weight of the heart 9½ ounces.

*Abdomen*.—The Fallopian tubes and mesenteric glands contained cysts filled with a transparent fluid. This tendency to the formation of cysts existed in the glandular structure of the body generally. Weight of the liver 40 ounces; the spleen 4 ounces; the stomach 5 ounces; the pancreas 3 ounces; the uterus 2 ounces; the kidneys 9½ ounces. There were four or five calculi in the pelvis of each kidney, causing dilatation thereof.

Case 814. A female, aged 58 years. Apoplexy of the *pons varolii*, combined with enlargement of the heart. She fell down in a fit in the workhouse, in one of the workshops, and was admitted directly to the infirmary, where she died the same day. The breathing was quick; pulse 84, rather hard. The sound of the heart indistinct at the base, but clear at the apex. Speechless. She had an habitual eruption on the face, which had suddenly disappeared before this attack.

Examination 17½ hours after death.

*Head*.—A quantity of fluid blood escaped when the scalp was divided. The brain was pale; the lateral ventricles contained from 3 to 4 ounces of clear fluid. A clot of blood beneath the *pons varolii*, rather more to the left than the right side; the surrounding

brain eroded to the size of a five shilling piece. Weight of the brain  $43\frac{1}{2}$  ounces.

*Chest.*—Congestion of the lower lobes of both lungs; the right lung weighed 27 ounces; the left 23 ounces. The left ventricle of the heart thickened, weight  $14\frac{1}{2}$  ounces.

*Abdomen.*—Intestines not examined. The liver soft, weight 50 ounces; the spleen soft, weight  $6\frac{3}{4}$  ounces; the stomach  $7\frac{1}{2}$  ounces; the pancreas 4 ounces; the uterus  $1\frac{1}{2}$  ounce; the kidneys  $9\frac{1}{2}$  ounces; and the renal capsules  $\frac{1}{2}$  ounce. Weight of the body 123 pounds; height 5 feet  $4\frac{1}{2}$  inches.

Case 815. A female, aged 70 years. Apoplexy, combined with a tumour on the brain, hemiplegia of the left side, and enlargement of the heart. She was admitted to the infirmary eight days before her death from out of doors. She had been in the habit of taking opium, and had an apoplectic fit six days before admission.

The body was examined thirty-seven hours after death.

*Head.*—A tumour, having a marbled appearance, red and gray, the size of a musket ball, situated in the cortical substance in the anterior portion of the right cerebral hemisphere, above the roof of the ventricle. There was a clot of blood, about one ounce in weight, in the posterior portion of the left hemisphere; the substance of the brain was eroded. Weight of the brain  $44\frac{1}{2}$  ounces.

*Chest.*—The lungs together weighed 42 ounces; the heart was enlarged, weight  $13\frac{1}{2}$  ounces.

*Abdomen.*—The liver weighed 43 ounces; the spleen  $3\frac{1}{2}$  ounces; the stomach  $5\frac{1}{2}$  ounces; the pancreas  $2\frac{1}{2}$  ounces; the uterus  $3\frac{1}{2}$  ounces; the kidneys  $7\frac{1}{2}$  ounces. Weight of the body 110 pounds; height 5 feet  $5\frac{1}{2}$  inches.

Case 816. A servant, aged 70 years. Apoplexy of the cerebellum. While she was in the office at the workhouse for parochial relief, she was seized suddenly in a fit, and was brought at once to the infirmary, where she died the same night. Pulse feeble and intermittent; face slightly flushed on admission. The body was examined three days afterwards.

*Head.*—Both the lateral ventricles filled with fluid blood. The right lobe of the cerebellum was eroded, and the structure mixed with clots of blood; weight of the brain 42 ounces.

*Chest.*—The lining membrane of the bronchial tubes thickened; the right lung weighed 9 ounces, the left 8 ounces; the heart weighed  $8\frac{1}{2}$  ounces.

*Abdomen.*—There was a fibrous tumour the size of a walnut attached to the left ovary. The liver weighed 31 ounces; the spleen  $2\frac{1}{2}$  ounces; the stomach  $3\frac{1}{2}$  ounces; the pancreas  $2\frac{1}{2}$  ounces; the uterus  $\frac{3}{4}$  ounce; the kidneys  $6\frac{1}{2}$  ounces; the renal capsules  $\frac{1}{2}$  ounce. Weight of the body 65 pounds; height 4 feet 10 inches.

Case 817. A female aged 73 years. Apoplexy combined with wasting of the brain, scirrhus of the left breast, and general debility. Admitted to the infirmary fourteen days before her death, at that time suffering from general debility. Pulse excessively weak; countenance pallid.



**Head.**—The cerebral convolutions wasted ; a quantity of brownish-coloured fluid on the surface beneath the arachnoid membrane. There was a layer of blood on each hemisphere, especially on the right side, where it went down to the base of the skull, the *dura mater* being covered by it in that situation. Weight of the brain 82 ounces.

**Chest.**—Contraction of the nipple and scirrhus tumour in the left breast ; slight cadaveric congestion of the lower lobe of the right lung, which weighed 14 ounces ; the left 10½ ounces. Old adhesions between the under surface of the heart and the pericardium ; weight of the heart 8½ ounces.

**Abdomen.**—The mucous membrane of the intestines healthy ; wasting of the organs. Weight of the liver 33 ounces ; the spleen 3½ ounces ; the stomach 4 ounces ; the pancreas 2 ounces ; the uterus 1 ounce ; the kidneys 5 ounces ; and the renal capsules ½ ounce. Weight of the body 67 pounds ; height 5 feet.

Case 818. A female, aged 73 years. Apoplexy of the cerebellum combined with asthma, and cysts in the kidneys. She was for seven weeks a patient in the infirmary. The body was examined thirty-six hours after death. On admission she was affected with diarrhœa, and suffered from cough and dyspnœa.

**Head.**—A clot of blood the size of an almond in the left lobe of the cerebellum.

**Chest.**—Chronic bronchitis and emphysema of both lungs, which weighed together 32 ounces. The right side of the heart and the trunks of the pulmonary vessels filled with fibrine ; the heart weighed 9½ ounces.

**Abdomen.**—The liver weighed 39¾ ounces ; the spleen 2 ounces ; the stomach 4½ ounces ; the pancreas 2½ ounces ; the uterus 1½ ounce ; the kidneys 6¾ ounces. Each kidney contained a cyst the size of a walnut filled with fluid. Weight of the body 73 pounds ; height 5 feet 1 inch.

Case 819. A female, aged 78 years. Apoplexy combined with softening of the brain, and hemiplegia of the opposite side (the left). The patient was for six weeks in the infirmary, and had superficial ulcers on both legs. The body was examined thirty-five hours after death.

**Head.**—There was a large clot of blood in the right *corpus striatum* and *optic thalamus* ; the brain around was softened ; weight 41½ ounces.

**Chest.**—Slight cadaveric congestion of the lungs, which weighed together 39¾ ounces ; the heart 9¾ ounces.

**Abdomen.**—Weight of the liver 40 ounces ; the spleen 2½ ounces ; the stomach 4½ ounces ; the pancreas 2½ ounces ; the uterus 1½ ounce ; the kidneys 6 ounces. Weight of the body 71 pounds.

Case 820. A female, aged 80 years. Apoplexy combined with disease of the heart, dropsy, and emphysema. This patient died in a chronic ward in the workhouse. The body was examined fifty hours after death.

**Head.**—A quantity of blood was found beneath the left cerebral hemisphere. Weight of the brain 45 ounces.

*Chest.*—There was fluid in both sides. The lungs were emphysematous, and their lower lobes congested; both together weighed  $33\frac{1}{2}$  ounces. The heart was enlarged, its cavities dilated, and it was adherent to the pericardium; weight of the heart  $12\frac{1}{2}$  ounces.

*Abdomen.*—The liver weighed  $32\frac{1}{2}$  ounces; the spleen  $2\frac{1}{2}$  ounces; the stomach 6 ounces; the pancreas  $2\frac{1}{2}$  ounces; the uterus  $2\frac{1}{2}$  ounces; and the kidneys  $8\frac{1}{2}$  ounces. Weight of the body 103 pounds; height 5 feet 5 inches.

Case 821. A female, aged 84 years. Apoplexy combined with softening of the brain. Admitted from the workhouse to the infirmary. Death occurred one week afterwards. The body was examined thirty hours after death.

*Head.*—There was a clot of blood on the posterior and outer surface of the right cerebral hemisphere and softening of the substance of the brain internal to it. There was a marbled appearance of the *centrum ovale* of the right hemisphere from blood and general congestion of the veins. The brain weighed 44 ounces.

*Chest.*—The lungs together weighed  $27\frac{1}{2}$  ounces; the heart 9 ounces; the aorta contained a clot of fibrine.

*Abdomen.*—The organs wasted. The liver weighed  $27\frac{1}{2}$  ounces; the spleen  $2\frac{1}{2}$  ounces; the stomach  $4\frac{1}{2}$  ounces; the pancreas 2 ounces; the uterus 1 ounce; the kidneys  $5\frac{1}{2}$  ounces. Weight of the body 75 pounds; height 5 feet.

*Remarks.*—The first two cases of apoplexy in newly born children are interesting in a medico-legal point of view, especially the one that lived 13 days, as the apoplexy in both was not probably consequent on the act of parturition.

I have frequently found blood extravasated on the brains of still-born children. Cruveilhier has stated that one-third the infants who die shortly after birth in La Maternite, die from meningeal apoplexy, which disease is beautifully delineated in his *Anat. Pathol.*, Quinzieme Liv. pl. 1.

An account of apoplexy of new born infants is to be found in Copland's Dictionary of Practical Medicine.

The remaining twenty-eight cases, thirteen males and fifteen females, were in adults, their ages varying from 28 to 84 years.

*Duration of illness.*—In six males and one female death was sudden; in two males and two females the disease continued 1 day; in one female 2 days; in one female 3 days; in one male and three females from 6 to 8 days; in two females 14 days; in one male 4 weeks; in one female 6 weeks, and in two females 7 weeks; in one male, No. 794, it was the second attack within a year: in two males and two females the duration was not ascertained. The largest proportion of the males died suddenly, three-fourths of them within the first day; whereas only one-fourth of the females died in that time. This was probably caused by the size of the heart being so great in the males, and forcing the blood rapidly in large quantity into the brain.

**Head.**—The *dura mater* was preternaturally adherent to the skull in two males, and in one male contained osseous deposit; in one female there was a tumour on the *dura mater*. There was opacity of the arachnoid in two males, clear fluid in the lateral ventricles in three males and one female, and in one male the fluid was mixed with blood; and the convolutions were often flattened.

In 796, there was a clot which weighed 8 ounces on the surface of both cerebral hemispheres; the *foramen magnum* was unusually small in this case, and the brain was more than the average size. In two other males and one female, the blood was on the surface and base of the brain; in one male, the ventricles on both sides were filled with blood, and in one there was a clot in the third and fourth ventricles.

The clot was in the right hemisphere in five males and seven females; in the right ventricle in one, and cerebral structure in three of the males, and in the *corpus striatum* in two; in the right ventricle in two, and cerebral structure in two of the females, and in the *corpus striatum* in one female.

The clot was in the left hemisphere in two males and four females; in the left *corpus striatum* in one, and in the cerebral structure in the other male; in the left *corpus striatum* in one, and in the cerebral structure in three females.

The clot was in the left lobe of the cerebellum in one male and in one female, in the right lobe in one female, in the *pons varolii* in one female.\*

The weight of thirteen male brains varied from 38 to 50½ ounces, and of thirteen female brains from 32 to 46 ounces; the average weight of the brain of the males, 45·5 ounces, that of the females, 42·2 ounces.†

**Chest.**—There was scirrhus left breast in one female, congestion of one or both lungs in seven males and five females, emphysema or bronchitis in four males and three females, pneumonia in one male, earthy deposit in the lung of one male, hydrothorax in one male and one female, fractured ribs in one male. The average weight of the right lung in thirteen males was 23 ounces, and in nine females, 17·8 ounces; the left lung in thirteen males was 22·6 ounces, and in nine females, 15·2 ounces; the lungs together in six females averaged 36 ounces. The lungs in the males varied in weight from 15 to 30 ounces each, and in the females, from 8 to 27 ounces.

The heart was enlarged in all the males, with the exception of No. 806, in which there was wasting of the kidneys; the enlargement was very great in the majority. Amongst the females there was also enlargement, (with two exceptions,) but the en-

\* Cases similar in Morgagni, Let. ii. Art. 20–24.

† The weight of the brain, at different ages, is given by me in the appendix to Wagner's Physiology, by Willis, p. 699.

largement was not so great in proportion. There was pericarditis in two females, and valvular disease in one male.

The weight of the heart varied in thirteen males from  $8\frac{1}{2}$  to  $23\frac{1}{2}$  ounces, and in fifteen females from  $8\frac{1}{2}$  to  $14\frac{1}{2}$  ounces; the average weight in the males was 15·7 ounces, and in the females nearly 11 ounces, which is 7 ounces above the average weight for males, and  $2\frac{1}{2}$  ounces for females.

*Abdomen.*—There was scrotal hernia in one; the omentum was loaded with fat in two males; cysts in the mesenteric glands and Fallopian tubes, and renal calculi in No. 813; the intestines semitransparent in No. 812; fibrous tumour in the left ovary in one; wasting of the organs in the oldest male and oldest female.

The weight of the liver in thirteen males varied from 27 to 60 ounces, and in fifteen females, from 27 to 65 ounces; the average weight in the males was 50·7 ounces, and in the females, 41·5 ounces.

The weight of the stomach in thirteen males varied from  $4\frac{1}{2}$  to  $8\frac{1}{2}$  ounces, and in fifteen females, from  $3\frac{1}{2}$  to  $7\frac{1}{2}$  ounces; the average weight in the males was 6·8, and in the females, 5·3 ounces.

The weight of the spleen in thirteen males varied from  $2\frac{1}{2}$  to  $7\frac{1}{2}$  ounces, and in fifteen females, from 2 to  $6\frac{3}{4}$  ounces; the average weight in the males was 4·7, and in the females, 3·6 ounces.\*

The weight of the pancreas in twelve males varied from 2 to 5 ounces, and in fifteen females, from 2 to 4 ounces; the average weight in the males was 3·1 ounces, and in the females, 2·6 ounces.

The weight of the uterus, without the appendages, varied in fourteen cases from  $\frac{3}{4}$  to  $3\frac{1}{4}$  ounces; the average weight was 1·8 ounce.

The kidneys were enormously enlarged from cysts in No. 794, weighing 41 ounces, which case I have left out in calculating the average weight. They were above the average weight in health in one other case among the males, and below the average in four males and seven females. The wasting and degeneration of the kidneys, especially amongst females who have died of apoplexy, is a very frequent occurrence. Apoplexy has been noticed as following ischuria by Bonetus, Sepulchretum de Apoplexia, Obs. 61, and by many writers since.

The weight of the kidneys in twelve males varied from  $5\frac{1}{2}$  to 13 ounces, and in fifteen females from 5 to  $9\frac{1}{2}$  ounces; the average weight in the males was 8·8 ounces, and in the females, 7·2 ounces, which is three-quarters of an ounce less than the average weight in health for females.

The weight of the body in thirteen males varied from 81 to 188 pounds, and in fourteen females, from 60 to 123 pounds;

\* An account of my observations on the weight of the spleen is given in Note cxxx. of Mr Gulliver's edition of Hewson's works.

the average weight of the males was 105 pounds, and of the females, 87 pounds.

The height varied in twelve males from 65 to 70 inches, and in thirteen females, from 58 to 65 inches; the average height of the males was  $66\frac{1}{2}$  inches, and of the females, 62 inches. A male dwarf of 50 inches, No. 796, has been omitted in calculating the height.

Causes in the males, enlargement of the heart, the same in a smaller degree in the females, with wasting of the kidneys. Disease of the blood-vessels a predisposing cause in both sexes.

Abercrombie has made three divisions of apoplexy; the 1st, with extravasation of blood; 2d, with effusion of serum; and, 3d, without morbid appearance. Coma is the characteristic symptom of all three; in the first, from extravasation of blood; the coma is frequently ushered in with premonitory symptoms, as headach, vertigo, sickness, &c. Abercrombie has given eighteen cases of the first, four of the second, and five of the third form.

As the morbid appearances have exclusively formed the basis of the arrangement herein followed, apoplexy, with extravasation of blood, is the only form included in Table VIII. Amongst the cases of fluid in the brain, or dropsy, in Table V., are to be found some (No. 728, 746, 747,) which might have been classed as cases of serous apoplexy, and also in Table VIII. *continued*, No. 830-1 and 2, in which there was atrophy of the kidneys. Fatal cases of apoplectic coma, in which no morbid appearances were detected, will be brought under notice hereafter.

The division of apoplexy into serous and sanguineous was antecedent to Morgagni, and was fully admitted by him, Let. 11, art. 8. Morgagni, Let. 11, art. 9, refers to the observation of Valsalva of extravasation of blood on the one side, and hemiplegia of the side opposite. This observation is confirmed in Art. 11, 13, 14, 15, and 17. The case in 13 was preceded by softening of the brain.

Dr Craigie "On the Pathological Anatomy of the Human Brain and Membranes," Vol. 18 and 19 of the Edin. Med. and Surg. Journal, has stated that blood is most frequently extravasated on the inferior surface of the brain, contiguous to the fissure of Sylvius, and that it has been remarked by the Wenzels that the white perforated spot of Vicq D'Azyr, in the interior extremity of the fissure, which admits a number of vessels from the Sylvian artery, is most frequently the part affected. In the central parts the blood is most frequently extravasated in the striated bodies and optic thalami. Of 392 cases collected by Andral, these bodies were affected in 298, and in 96 of them the *corpora striata* in 61, and optic thalami in 35.

The disorganization of structure around a clot effused slowly, was noticed by J. Hunter in the space of from 70 hours to 8 days, and was considered to be a species of suppuration.

When the patient survives, a serous fluid occupies the place of the blood and fills the cavity, which is obliterated. A yellowish membrane\* is sometimes found lining a cavity in which is a little serum. In more recent stages a firm coagulum is found changed to a dark brownish colour.

Blood, when extravasated in the arachnoid sac, the *apoplexie de meninges* of the French, owing to a property of viscosity which the fibrin† possesses in passing from the liquid to the solid state, gives rise to the production of false membranes; a good account of which may be found in the *Dict. de Medecine*, Vol. xi., p. 451-2, and also by Mr Hewett in the *Med. Chir. Trans.*, Vol. 28, p. 46.

TABLE VIII. *continued.* PARALYSIS. (5 MALES.)

Case 822. A baker, aged 42 years. *Paralysis agitans*, combined with disease of the brain and bronchitis. This man died in a chronic ward in the workhouse. The body was examined two days after death. For several years he was so affected with the shaking palsy that he was unable to feed himself or to sit up in a chair, and was almost entirely confined to bed. He had been for several months a patient in the infirmary without deriving any benefit.

*Head.*—Several white specks on the arachnoid membrane, and an unusually large quantity of fluid beneath it; the right cerebral hemisphere appeared to be larger than the left; in the *centrum ovale* was a gray coloured spot the size of a shilling, like the cineritious portion of the brain; when a thin transverse section of this part of the brain was held to the light, the gray spot was found to be semitransparent, and appeared to be thinner and to contain less matter than the surrounding medullary structure of the *centrum ovale*. The lateral ventricles contained about three ounces of clear fluid; the walls of the ventricles were unusually firm, and the lining membrane resisting. Weight of the brain 45 ounces.

*Chest.*—General bronchitis. The right lung weighed 16½ ounces; the left 18½ ounces; the heart was unusually small, weight 5¼ ounces.

*Abdomen.*—The viscera healthy. The liver weighed 38 ounces; the spleen 4 ounces; the stomach 3¾ ounces; the pancreas 2 ounces; the kidneys 6½ ounces; and the renal capsules ½ ounce; weight of the body 67 pounds; height, 5 feet 5 inches.

Case 823. A linen-draper, aged 47 years, single. Paralysis of the left side, combined with convulsions and disease of the right side of the brain. He was brought in by the police on a stretcher in a state of insensibility, and died on the second day. The mouth was contorted; the extremities cold; he spoke once after admission. There was a coroner's inquest on the body. His sister stated that he had paralysis of the left arm from his birth; that he had a

\* A particular examination of the yellowish matter in the site of old apoplectic effusions is given in Mr Gulliver's notes, *Edin. Med. and Surg. Jour.*, No. 156, p. 159, where the true nature of this yellow matter was for the first time explained.

† On the interesting subject of the viscosity of fibrin, see the references in Mr Gulliver's edition of Hewson's works, p. 42.

most kindly disposition, was an excellent penman and accountant ; for nearly two years he had been in a lawyer's office, and afterwards followed the business of a linen-draper. He had a great disinclination to keep himself clean, and was a miser in disposition. He had a large appetite, but was not at all addicted to drunkenness.

The left wrist was very much contracted ; the left elbow was also contracted, but not so much so as the wrist ; there was also want of power in the left leg, and it was shorter than the right, which caused him to halt in walking ; the extremities on the left side were smaller than those on the right side. The body was examined two days after death.

*Head*.—There was fluid over the right cerebral hemisphere ; when the *dura mater* was removed a quantity of clear fluid escaped ; there were no cerebral convolutions externally, and the hemisphere appeared to be only half the size of the other ; the surface was covered by a membrane filled with a clear fluid ; the brain below the fluid was unusually firm, and presented no other peculiarity ; the left cerebral hemisphere was quite natural ; it was double the weight of the right. Weight of the right cerebral hemisphere  $9\frac{1}{2}$  ounces ; weight of the left cerebral hemisphere  $18\frac{1}{2}$  ounces ; the cerebellum  $5\frac{1}{4}$  ounces ; and the *medulla oblongata*  $\frac{3}{4}$  ounce.

*Chest*.—No pleuritic adhesions ; slight cadaveric congestion of the lower lobe of the left lung. The right lung weighed  $19\frac{1}{2}$  ounces ; the left 21 ounces ; the heart  $8\frac{1}{2}$  ounces.

*Abdomen*.—The mucous membrane of the intestines healthy ; the weight 44 ounces when opened and washed ; weight of the liver 46 ounces ; the spleen  $3\frac{1}{2}$  ounces ; the stomach  $4\frac{1}{2}$  ounces ; the pancreas  $3\frac{1}{2}$  ounces ; the right kidney 4 ounces ; the left 6 ounces and 1 drachm ; the renal capsules  $3\frac{1}{2}$  drachms. Weight of the body 97 pounds ; height 5 feet 6 inches.

Case 824. A labourer, aged 50 years, a single man. Paralysis of the muscles of deglutition, combined with aphony, and pneumonia of the right lung.

Aphony had existed more or less for several months before his admission ; and he died in the infirmary five days after. For several hours before death he was unable to swallow, even fluids ; the difficulty in deglutition had been gradually increasing after his admission. The stomach tube was introduced to pass some nutriment, but he did not long survive. The body was examined seventeen hours after death.

*Head*.—The brain natural ; weight 47 ounces. There was a contracted state of the *rima glottidis*, and a tucking in of the parts beneath the epiglottis ; the œsophagus was natural.

*Chest*.—A portion of the lower lobe of the right lung in the first stage of pneumonia ; the weight  $24\frac{1}{2}$  ounces ; the left 17 ounces, healthy ; the heart 9 ounces.

*Abdomen*.—The stomach healthy ; the weight 6 ounces. Weight of the liver 51 ounces ; the spleen  $2\frac{1}{2}$  ounces ; the pancreas 3 ounces ; the kidneys  $9\frac{1}{2}$  ounces ; and the renal capsules  $\frac{1}{2}$  ounce.

There was scrotal hernia on the right side. Weight of the body 93 pounds ; height 5 feet 5 inches.

**Case 825.** A male, aged 59 years. Paralysis, disease of the brain, and pulmonary tubercles. He died in a chronic ward in the workhouse. About four years before he had a fit of apoplexy attended with hemiplegia of the right side, at which time he became a patient in the infirmary, where, after some time, he so far recovered as to be able to walk about, and he was transferred to the workhouse. The use of the right arm did not return; the elbow and wrist joints became stiff and contracted. While in the workhouse upon two occasions he was attacked with convulsions, of which he soon recovered; since the last and fatal attack he has been quite paralysed, lifted in and out of bed, and required to be fed—appetite good, and bowels regular.

The body examined 68 hours after death.

**Head.**—The brain exsanguinous; the lateral ventricles contained about 1 ounce of clear fluid. There was a brown cicatrix three-fourths of an inch long and about one-eighth of an inch broad, with a white line along the centre; in the left *optic thalamus*, and close by, small cells filled with fluid; these appearances were probably the result of the first apoplectic attack.

In the right *corpus striatum* there was a brown speck similar to the one described, but smaller, and one still smaller in the *optic thalamus* of the same side. Weight of the brain  $44\frac{1}{2}$  ounces.

**Chest.**—A few hardened tubercles in the lungs, and slight tuberculous ulceration in the surface of the upper lobe of left lung. The right lung had some cartilaginous matter on its apex. Weight of the right lung 23 ounces; the left  $25\frac{1}{2}$  ounces; the heart  $8\frac{1}{2}$  ounces.

**Abdomen.**—The mucous membrane of the intestines was healthy; the organs were small. Weight of the liver 33 ounces; the spleen 3 ounces; the stomach 6 ounces; the pancreas 3 ounces; the kidneys  $5\frac{1}{2}$  ounces; the renal capsules  $\frac{1}{2}$  ounce. Weight of the body 84 pounds; the height 5 feet 8 inches.

**Case 826.** A male, aged 73 years. Paralysis, rusty-coloured deposit and cysts, wasting of the brain, and pneumonia. This patient died in a chronic ward in the workhouse; no previous history. The body was examined the day after death.

**Head.**—At the lower part of the right *corpus striatum* was a small oval cyst, the sides of a rusty colour (apoplectic); there was a similar cyst in the centre of the right lobe of the cerebellum. Weight of the brain 36 ounces.

**Chest.**—Pneumonia of the posterior portion of the lower lobes of both lungs; the lungs together weighed  $44\frac{1}{2}$  ounces; the heart  $8\frac{1}{2}$  ounces.

**Abdomen.**—The intestines not examined. The organs small. Weight of the liver  $31\frac{1}{2}$  ounces; the spleen 1 ounce; the stomach  $4\frac{1}{2}$  ounces; the pancreas 3 ounces; the kidneys 6 ounces. Weight of the body 85 pounds; the height 5 feet 3 inches.

#### TABLE VIII.—*Continued.* PARALYSIS. 8 FEMALES.

**Case 827.** A female idiot, aged 46 years. Hemiplegia of the left side, combined with disease of the same side of the brain, chro-



nic pneumonia. Enlarged heart. She died in a chronic ward in the workhouse, in which she was bed-ridden for several years.

A few hours before her death she had a fit; the face was drawn to one side in the fit.

The body was examined the day after death.

*Head.*—A large quantity of clear fluid escaped from a wound in the *dura mater* when the skull-cap was removed. The left cerebral hemisphere appeared smaller, and was firmer than the right; about one-half of the upper and outer side of the left *corpus striatum* was occupied by cysts, as well as about an equal portion of the brain just external; the cysts were filled with a clear fluid. The weight of the brain 40 ounces.

*Chest.*—There was emphysema of the upper lobes of both lungs; the lower lobes were gorged with blood, and the structure broke down readily by pressure from the finger. The right lung weighed 19 ounces; the left 13 ounces; the heart  $13\frac{1}{2}$  ounces.

*Abdomen.*—The intestines not examined. Weight of the liver 48 ounces; the spleen 4 ounces; the stomach  $5\frac{1}{4}$  ounces; the pancreas  $2\frac{1}{2}$  ounces; the kidneys 11 ounces. Weight of the body 83 pounds; height 5 feet 4 inches.

Case 828. A female, aged 56 years. Paralysis, fluid in the brain. The paralysis was general, it had existed for five years; at first the lower extremities became affected, and two years afterwards the upper extremities became paralysed. She required to be fed. The faculties entire. Ruddy complexion; good appetite; stout till within the last few months, when she began to fall off in appearance. The bowels seldom open without the aid of medicine. She died two weeks after admission to the infirmary. There was a bed-sore on the sacrum. The body examined 27 hours after death.

*Head.* The ventricles of the brain distended with about  $1\frac{1}{2}$  ounces of clear fluid; brain firm; the weight 44 ounces.

*Chest.*—Cadaveric congestion of the right lung; the weight  $11\frac{1}{2}$  ounces; the left 7 ounces; the heart small, weight 6 ounces.

*Abdomen.*—Intestines not examined; the organs small; the left lobe of the liver unusually small, forming a mere band one inch and a-half in breadth, from the suspending ligament. Weight of the liver  $38\frac{1}{2}$  ounces; the spleen  $\frac{3}{4}$  ounce; the stomach  $2\frac{1}{4}$  ounces; the pancreas  $1\frac{1}{2}$  ounce; the kidneys  $7\frac{1}{4}$  ounces; the uterus  $\frac{3}{4}$  ounce. Height 4 feet 10 inches.

Case 829. A female, aged 64 years. Paraplegia, wasting of the right cerebral hemisphere, pleurisy of the left side, and *fistula in ano*. For the last ten months she was paralysed, and was unable to get in or out of bed without assistance. Six months before her death she was sent from the infirmary to a chronic ward in the workhouse, where she died. She complained in her last illness principally of a pain in her left side. The body was examined two days after death.

*Head.*—The convolutions of the right cerebral hemisphere were wasted. Weight of the brain  $42\frac{1}{2}$  ounces.

*Chest.*—No pleuritic adhesions. More fluid than usual in the

left pleura. Weight of the lungs together  $24\frac{1}{2}$  ounces; the heart 8 ounces.

**Abdomen.**—Weight of the liver 55 ounces; the spleen  $6\frac{1}{2}$  ounces; the stomach 6 ounces; the pancreas  $2\frac{1}{2}$  ounces; the kidneys 7 ounces; the uterus  $\frac{1}{2}$  ounce. Weight of the body 85 pounds; height 5 feet 3 inches.

Cas 830. A female, aged 64 years. Hemiplegia of the right side, disease of the opposite side of brain, and convulsions. She was paralysed for eight years, and died in a chronic ward in the workhouse, where she had been removed from the infirmary four months before. She was occasionally subject to convulsions.

**Head.**—There was a cyst containing fluid in left *corpus striatum*, large enough to hold an almond, the walls of a rusty colour, very probably at one time the seat of an apoplectic clot; the brain around the cavity was unusually firm; there was no recent disease of the brain. Weight of the brain  $44\frac{1}{2}$  ounces.

**Chest.**—Congestion of the lower lobe of the left lung. The right lung weighed  $14\frac{1}{2}$  ounces; the left  $18\frac{1}{2}$  ounces; the heart  $10\frac{1}{2}$  ounces.

**Abdomen.**—The liver weighed  $88\frac{1}{2}$  ounces; the spleen 6 ounces; brain, the stomach  $4\frac{1}{2}$  ounces; the pancreas  $2\frac{1}{2}$  ounces; the kidneys, (unusually small,)  $5\frac{1}{2}$  ounces; and the uterus  $1\frac{1}{2}$  ounce. Weight of the body 97 pounds; height 5 feet 1 inch.

Case 831. A female, aged 68 years. Paralysis, with fluid in the brain and disease of the kidneys. In a state of insensibility when admitted to the infirmary; she died the following day. The body was examined twenty-two hours after death.

**Head.**—The lateral ventricles contained three ounces of clear fluid. There was no disease of the spinal marrow, which was carefully examined. Weight of the brain 43 ounces.

**Chest.**—Weight of both lungs 42 ounces; the heart 10 ounces.

**Abdomen.**—Weight of the liver  $42\frac{1}{2}$  ounces; the spleen  $1\frac{1}{2}$  ounces; the stomach  $6\frac{1}{2}$  ounces; the pancreas 3 ounces; the kidneys unusually small, the right one contained a cyst; weight of both kidneys  $5\frac{1}{2}$  ounces; the uterus  $3\frac{1}{2}$  ounces. Weight of the body 94 pounds; height 5 feet 1 inch.

Case 832. A female, aged 69 years. Hemiplegia of the right side; disease in the left side of the brain; wasting of the kidneys; and bronchitis; sudden death. She had been paralysed for two years, but had so far recovered that she was enabled to walk, and even to sew a little. The bowels required to be kept open by medicine; the appetite was great, and she indulged it when she had an opportunity. Two days before her death she had a fit, became comatose, and died in a chronic ward in the workhouse.

The body was examined the day after death.

**Head.**—A considerable quantity of fluid on the surface beneath the arachnoid; the cerebral convolutions unusually firm. A dark line about one-eighth of an inch in breadth, consisting of a smooth membranous lining, with rusty-coloured deposit in a depression passing through the centre of the left *corpus striatum*; probably the

result of the apoplexy two years before. Brain wasted; weight, 38½ ounces.

*Chest*.—The size of a pea of earthy matter in the posterior portion of the upper lobe of the left lung; congestion of the lower lobes of both lungs. The bronchial tubes filled with frothy mucus; redness of the lining membrane. The right lung weighed 20 ounces; the left 18½ ounces; the heart 11½ ounces.

*Abdomen*.—The small intestines semi-transparent, their coats unusually thin; the mucous membrane of the large intestines thickened, and of a dark colour. Weight of the liver 33½ ounces; the spleen 2 ounces; the stomach 6 ounces; the uterus 1 ounce and 2 drachms. The kidneys much wasted; the weight of both together 4 ounces; the renal capsules ½ ounce. Weight of the body, 93 pounds; height 5 feet 6 inches.

Case 833. A female, aged 70 years. Paralysis; disease of the brain. She died in a chronic ward in the workhouse.

The body was examined the day after death, and was much emaciated.

*Head*.—There was wasting of the cerebral hemispheres, and the lateral ventricles were distended with fluid. The remains of an old apoplectic clot was observed in the right *corpus striatum*. Weight of the brain, 33½ ounces.

*Chest*.—The viscera natural; weight of the lungs together 32 ounces; the heart 8½ ounces.

*Abdomen*.—The gall bladder was filled with calculi. Weight of the liver 39½ ounces; the spleen 6 ounces; the stomach 4½ ounces; the pancreas 2 ounces; the kidneys 6½ ounces; the uterus 1 ounce. Weight of the body 67 pounds; height 4 feet 11 inches.

Case 834. A female, aged 70 years. Paralysis; fluid in the brain; convulsions and stupor.

For some years she had been an assistant in the insane wards in the infirmary, and had always something singular in her manner. Several months before her death she became affected with convulsions, and had paralysis of the lower extremities, for which she was a patient in the infirmary. She became an inmate of a chronic ward in the workhouse ultimately. The convulsive attacks occurred occasionally. Shortly before her death she had an unusually severe attack, and remained in a state of stupor ever afterwards; she was removed again to the infirmary, where she died in twelve days.

The body was examined the day after death.

*Head*.—The lateral ventricles contained 3 ounces of clear fluid. There were numerous osseous deposits in the arterial coats. Weight of the brain 44½ ounces.

*Chest*.—Pleuritic adhesions; some induration of a small portion of the lower lobes of both lungs. The right lung weighed 14½ ounces; the left 14½ ounces; the heart 10½ ounces.

*Abdomen*.—The organs natural. Weight of the liver 4½ ounces; the spleen 5 ounces; the stomach 5½ ounces; the pancreas, 3 ounces; the uterus 1½ ounces; the kidneys, large, 11½ ounces. Weight of the body 84 pounds; height 5 feet 2½ inches.

*Remarks.*—Of the thirteen cases of paralysis, there was evidence of the larger proportion being the result of sanguineous apoplexy, at a more or less distant period ;—a chronic stage of that disease, therefore, they have been placed as a continuation of Table VIII. No. 822 was a case of *paralysis agitans* and gray softening. No. 824 was a case of aphony and paralysis of deglutition, without any morbid change in the brain. In the three remaining cases among the males, there was disease of one side the brain. In two of them the hemiplegia was on the opposite side. In the third the side was not stated. The paralysis was about equal on each side the body.

Among the eight female cases, there was disease of the brain in each. In No. 828, general paralysis, fluid in the ventricles, and induration of the brain. There was fluid in the ventricles only in No. 831 and 834. There was disease on one side the brain in five ; in the first, No. 827, the disease of the brain and the paralysis were on the same side ; in two, No. 830 and 832, the disease and paralysis were on opposite sides ; and not stated in the remaining two.

The ages of the thirteen cases varied from 42 to 73 years. In a few the duration of the disease was ascertained to have been from ten months to forty-seven years. Death was preceded by convulsions in five ; in four, death was sudden ; in three, the last illness continued from 5 to 14 days.

*Head.*—The pupils permanently dilated in one ; white specks on the arachnoid in one ; fluid on the surface, and wasting of the convolutions in five ; fluid in the ventricles in six, with wasting of the central parts of the brain. Softening of the left *centrum ovale* in one ; cysts and rusty deposit in the right *corpus striatum* in two ; and in right lobe of cerebellum in No. 826. A similar state of the left *corpus striatum* in three females ; a firm cicatrix, &c. in left *optic thalamus* in No. 825.

The weight of the brain varied in five males from  $33\frac{1}{4}$  to 47 ounces, the average weight  $41\frac{1}{4}$  ounces ; and in eight females, from  $33\frac{1}{4}$  to  $44\frac{1}{4}$  ounces, the average weight  $35\frac{1}{4}$  ounces. The brain was, therefore, 4 ounces below the average in the males, and about 6 ounces in the females.

*Chest.*—There was congestion of the lungs in two ; pneumonia in three ; asthma in three ; pleuritis in two. The weight of the right lung in four males varied from  $16\frac{1}{2}$  to 23 ounces, and in five females,  $11\frac{1}{2}$  to 20 ounces ; the average weight in the males was 20.7, and in the females 16 ounces. The weight of the left lung varied in five males from 17 to  $25\frac{1}{2}$  ounces, and in five females from 7 to  $18\frac{1}{2}$  ounces ; the average weight in the males was 20.5, and in the females,  $14\frac{1}{4}$  ounces.

The weight of the heart varied in five males from  $5\frac{1}{2}$  to 9 ounces,

and in eight females, from 6 to 13½ ounces; the average weight in the males was 8·5, and in the females, 9·7 ounces.

*Abdomen.*—The intestines were diseased in No. 832; the gall bladder filled with calculi in one; and atrophy of the right kidney in one male; and of both in one male and three females.

The weight of the liver in five males varied from 31½ to 51 ounces, and in eight females from 33½ to 55 ounces; the average weight in the males was 39·9, and in the females, 41·2 ounces.

The average weight of the spleen in five males was 2·8, and in eight females, 4 ounces.

The weight of the kidneys varied in five males from 5½ to 10 ounces, and in eight females, from 4 to 11½ ounces; the average weight in the males was 7·5, and in the females, 7·3 ounces.

The average weight of the stomach was 4·9 in the males, and 5 ounces in the females. The average weight of the uterus in six was 1·5 ounces.

The weight of the body varied in five men from 67 to 97 pounds, and in seven women from 67 to 97 pounds; the average weight in the men was 85·2, and in the women, 86·1 pounds, from which it appears the women had the advantage of the men in weight. The same was the case, too, with respect to some of the organs, as the spleen, liver, and especially the heart, the relative size of which is remarked by Dr Clendinning to influence that of the body generally.

The average height of the males was 65·4, and of the females, 61·8 inches. Among the males the brain, liver, spleen, and kidneys were all below the average; there was also general emaciation of the body. Among the females the brain was considerably below the average weight as well as in the males, but there was a much smaller difference in the other organs mentioned.

The current opinion, that paralysis is more common in men than in women, is contrary to the evidence of the foregoing cases—a circumstance remarkably coincident with what has been already observed as regards apoplexy.

That paralysis would be more frequent in women than in men might be expected when we remember the fatality of apoplexy among the latter, for paralysis may often be regarded as a termination of apoplexy; and in women, as apoplexy is less fatal, the consequence of it, paralysis, will be found more frequent.

From the foregoing cases there appears to be a pathological cause of the fatality of apoplexy among men, viz., the great enlargement, and consequently increased force of the heart, producing a more extensive destruction of the brain.

There is a form of paralysis associated with insanity, which will come more properly under the latter head, as well as certain other peculiarities which will form the subject of special notice hereafter.

**ART. II.—***Statistical Report on the Sickness and Mortality among the Troops serving in the Madras Presidency. Prepared from official documents printed by order of the Madras Government.* By T. GRAHAM BALFOUR, M. D., Grenadier Guards.

THE extensive British possessions in India, comprehending within them such diversities of physical geography and varieties of climate, offer a wide field for the study of the natural history of disease and of the influence of climate on the different races of mankind, which has hitherto been little cultivated. Of late years the increased attention paid to this interesting branch of science has led to the collection of much valuable information, which, however, has not yet been made sufficiently available to the medical profession. We purpose in the following report to submit the results of an investigation into the sanitary condition of the troops in the Madras Presidency, instituted by order of the Supreme Government.

In 1835 Mr J. R. Martin, Presidency Surgeon, Calcutta, brought under the notice of Sir Charles Metcalfe, the Governor-General, the great advantages which might arise to the army from the adoption of a well-organized system of reports on the topography and sanitary statistics of the different stations in India. These reports were to be furnished periodically by the officers of the medical department, and to be collated for publication under the direction of the medical boards of the three Presidencies. Mr Martin, at the same time, submitted a memoir containing the details of a plan for collecting and arranging these materials, and specifying the subjects on which information was required. The Governor-General, justly appreciating the value of the suggestions, directed the memoir to be circulated to the medical department, which was done in the following official memorandum, dated 25th November 1835.

“Memorandum to be circulated to the medical service by the Medical Board.

“1. The Honourable the Governor-General of India in council is pleased to direct that the officers of the medical service, whether in the civil or military branches, be required to furnish, through the superintending surgeons of divisions, information on the following points having reference to the medical topography of the district, station, or cantonment, whether fixed or temporary, with the localities of which each officer may in the course of service be best acquainted.

“2. In the present order it is only intended to point out matter on which information is considered essential, but further de-

tails will be arranged by the medical board on questions incidental to general medical topography, and on which it is hoped that much interesting and useful information will be furnished by those officers whose qualifications and experience enable them to speak to such matters.

"3. The topographical reports, when forwarded to the presidency by the superintending surgeons, will there be collected by a committee of three medical officers, nominated by the medical board, and such as are approved of will be ultimately printed and formed into a memoir, a copy of which will be furnished to all staff-surgeons and officers of the quarter-master-general's department.

"4. The reports required from the medical service should contain specific information on the following points:—

#### TOPOGRAPHICAL DETAIL.

"1st. Situation, boundary, elevation, facility and mode of communication with the place described; general direction of the prevailing winds, &c. Mountains, with particular notices of such ranges as might afford advantage and convenience for sick convalescent troops.

"2d. Seas, rivers, lakes, wells, morasses, drainage, state of the canal, &c.

"3d. The climate; its physical character and medical effects, &c.; with the highest, lowest, and medium states of the thermometer.

"4th. The soil; its general nature, its elevation above the adjacent seas and other waters; nature of the waters; the period of the year when noxious exhalations arise from the soil in greatest abundance; and the extent to which evaporation has proceeded when these exhalations become most deleterious, &c.

"5th. Vegetable, animal, and mineral products.

"6th. The state of the agriculture.

"7th. Roads and communications.

"8th. The diseases, endemic and epidemic, and those that may be hereditary. The diseases of particular classes of manufacturers, of prisons, and poor-houses.

"9th. On the state of the barracks, their situation, the date of their erection, their form—whether built in square or parallel lines, or in detached houses, and whether of wood, brick, or stone—quality of the supply of water, whether from springs, wells, or rivers.

"10th. Nature of the soil on which the barracks are built, and of that immediately around; their state in regard to damp, cold, or exposure to particular winds, and their general aspect; drainage of the ground of the barracks.

"11th. Size of the rooms in feet, as to height, length, and breadth; number of windows and doors.

"12th. State and dimensions of the bedsteads ; how many the barracks will accommodate.

"13th. State of the kitchen and other out offices.

"14th. State of the places of confinement, as to situation, dryness, &c. ; and whether any particular disease has ever been traced to them.

"15th. The hospital. The same questions as relating to the barracks.

"16th. Distance of the hospital from the barracks, and whether there be a separate airing ground for the convalescents.

"17th. State of the store rooms, the surgery, and dead-house, attached to European corps.

"18th. Whether any patients have ever laboured under any diseases that could fairly be attributed to the locality of the hospital.

"19th. Sketch maps of particular localities would prove a great addition to the reports. (Signed) W. CASEMENT, Col. C. B., Secretary to the Government of India, Military Department."

In compliance with this order, reports were forwarded by the officers on the Madras establishment to the medical board of that presidency, but they were in many respects so defective, that repeated references regarding them were necessary, and it was not until August 1842 that the board was enabled to print for circulation a "General Topographical and Statistical Account of each of the Military Divisions of the Presidency," compiled from these documents.

It is much to be regretted, that, owing to the want of uniformity in the returns in use in India, the data from the various stations frequently differ in form, and are, in consequence, not always available for the purposes of comparison, and that this defect cannot be remedied, owing to a large number of the diseases being included under the general term of "other diseases," instead of being distinctly specified. There is, however, much information in regard to the more prevalent diseases both among Europeans and natives, which will prove a valuable addition to our knowledge on this subject. This we have endeavoured to arrange in a form adapted for the purpose of comparison, as illustrating the influence of locality and race on the development and results of morbid action.\*

\* We understand that orders have been recently sent from this country, directing the adoption of a uniform nomenclature and system of medical returns in the three presidencies, so that we may anticipate receiving, in future, more complete and accurate information on the subjects comprehended under the title of medical statistics. It is melancholy to reflect that such an order was necessary to effect so desirable an object, and that the measure did not originate with the members of the medical boards, whose duty it was, and whose ambition it ought



The Madras Presidency lies between the 8th and 22d degrees of N. Lat., and 75th and 85th degrees of E. Long., being bounded on the north by Hindostan Proper, on the south by the Indian Ocean and Gulf of Manaar, on the east by the Bay of Bengal, and on the west by the Indian Ocean and the Bombay Presidency.\*

The country may be described as consisting of extensive plains stretching from the sea coast to the foot of the mountain ranges, and varying in breadth from 30 to 70 miles; of two chains of mountains termed the Eastern and Western Ghauts, running from north to south throughout the Presidency; and of the Table Lands between these two chains. The climate of the different parts of a country, comprising an area of 140,000 square miles, and presenting such variety of physical aspect, must obviously vary greatly, and be influenced by numerous local modifying circumstances; we shall therefore reserve our observations on this subject till we come to the description of the various military stations in detail. The principal circumstance affecting the climate of Madras is the occurrence of the periodical winds or monsoons. The N. E. monsoon commences about the middle of October and continues till the end of February, and the S. W. blows from the beginning of May till the beginning of September: heavy rains and much thunder and lightning accompany the setting in of each. In March and April southerly winds prevail; and from the end of August till the beginning of October the winds are very variable and the weather close, sultry, and oppressive. The period of the setting in and termination of the monsoons varies with the latitude, but the above may be considered a general description of their prevalence in this Presidency.

The troops on the establishment have generally consisted of one cavalry and six infantry regiments of the Royal Army, the E. I. C. European Artillery and Madras Regiment of Infantry, and of their native army composed of cavalry, artillery, and infantry. The European soldiers in the Company's service are enlisted in the United Kingdom in the same manner as for Her Majesty's army, but are entitled to their discharge after 21 years' service with a pension of one shilling a day, or, if discharged as unfit on account of broken constitutions after 14 years' service, with a pension of ninepence.

The Sepoy, if he wishes it, is entitled to his discharge in time of peace after having served three years, provided the regiment is near-

to have been, to advance the best interests of a profession in which they have risen to the most honourable and most lucrative appointments in the service of the East India Company.

\* In addition to the territory on the peninsula, the Madras Presidency comprises the British possessions on the Tenasserim coast, and at Singapore, Malacca, and Penang. We propose, however, to confine our observations to the troops serving in the peninsula of India.

ly complete to its establishment, but, in time of war, may be retained as long as his services are deemed necessary. After 15 years' service, if labouring under a disability which disqualifies him for active duty, or if wounded or having contracted incurable disorders in the service before completing that term, Sepoys may be recommended to be placed upon the invalid establishment. Those who are fit for garrison duty are drafted into invalid battalions, while the others are permitted to retire on the invalid pay to any place within the Company's dominions. Native soldiers convicted of theft are discharged as being a disgrace to the military profession, and their condition being greatly superior in point of pay to that of the class from whom they are taken, this is considered a severe punishment.

The Sepoys are not enrolled under the age of 16 nor above 30, and are in general active healthy men. In 1838, about six-sevenths of the native cavalry, and two-fifths of the native infantry in the Madras Presidency were Moosulmans—the rest being Hindoos.

During the ten years, 1829–38, the average annual strength of the Madras army has been 10,343 Europeans, and 56,840 natives. The total admissions into hospital among the former have amounted to 186,865, and the deaths to 4,725; and among the latter the admissions have been 347,327, and the deaths 9,121. Reducing these to a common ratio we find the proportions to have been as follows :—

|                       | Annual ratio per 1000 of Strength. |       |
|-----------------------|------------------------------------|-------|
|                       | Admitted.                          | Died. |
| European troops,..... | 1807                               | 45·7  |
| Native troops, .....  | 611                                | 16·   |

Thus it appears that the admissions and deaths among the Europeans have been nearly thrice as numerous, in proportion to the strength, as among the native troops. We shall postpone the consideration of the relative prevalence of the different classes of diseases till we have briefly described the various military posts of which the medical details are available.

The Madras Presidency forms seven military divisions, with three stations beyond the frontier and one beyond seas. This arrangement has been followed in the preparation of the Reports by the Medical Board; but however suitable it may be for military purposes, it does not seem to be well adapted for the investigation of the influence of climate on the health of troops, or its modifying effects upon disease. We shall, therefore, adopt a different classification of the stations, and examine,

1st, Those situated on, or immediately adjacent to the sea coast.

2d, Those on the plains between the coast and the mountain ranges.

3d, Stations on the table lands.

4th, Peculiar stations, including under this head two on the coast, viz. Cuddalore, where the European pensioners are located, and Vizagapatam, (as far as regards European troops,) which is occupied by the Carnatic European Veteran Battalion; and two stations on the plains, viz. Wallajahbad, where are the head quarters of a Native Veteran Battalion and the Drumbooy Establishment, and Poonamallee, the depot of Her Majesty's troops, where recruits arriving from England remain for some time previous to joining their corps, and invalids wait till an opportunity occurs of sending them home. It is obvious that, to include these in any of the other three classes, would be apt to lead to erroneous conclusions.

### 1. *Stations on the sea coast.*

Commencing on the Malabar coast, the first military station is the cantonment of

1. *Mangalore*, situated in 12° 51' N. lat., 74° 54' E. long., in the immediate vicinity of the sea, but separated from it by a back water, formed by the junction of the Bolar and the Balooze. The town and cantonment stand on a peninsula formed by these rivers, which, in the rainy season, are navigable for a considerable distance inland; but in the dry season contain little water, except what flows in with the tide. Their banks are high and steep, planted with coco-nut trees, or laid out in gardens or rice fields, and their beds are sandy or gravelly. Immediately under the cantonment, however, an extensive and deep bed of alluvium has been deposited from the meeting of the two rivers. The peninsula is surrounded by a level belt of land from one to two hundred yards wide, converted at the southern extremity into rice fields, or thickly planted with coco-nut trees. Along this belt the fishermen and labourers chiefly reside; and the great bazaar extends north about half-a-mile. Toward the north end of the peninsula the houses are detached on separate hills, which, with the intervening low ground, are covered with jungle. Immediately beyond the cantonment the country becomes more elevated, rugged, and barren. The valleys in the neighbourhood contain a deep rich soil, and are very carefully cultivated. The chief produce is rice, of which three crops are obtained within the year.

The cool season extends from November to March, during which time the thermometer ranges from 65° to 75°; from that period till May it stands at from 80° to 86° in the shade, and for a short time before the monsoon sets in, even as high as 90°; about the middle of May, when the rains have commenced, the heat becomes moderated, and the temperature ranges between 75° and 82°. The fall of rain averages about 128 inches annually.

The cantonment stands on the north side of the town on a gently rising ground; the Sepoy lines are on the south side of the parade, open to the sea breeze, and well drained. The huts are built of clay, and thatched with grass, and extend in parallel lines from east to west. The hospital is well raised, dry, and airy, and stands at their north-east end. There are no European troops at Mangalore; the aggregate\* strength of the native force stationed there during ten years, 1832-41, has amounted to 11,079, among whom 7875 admissions and 151 deaths have occurred, being in the proportion of 710 and 13.6 per 1000 of the strength annually.

Passing southwards along the coast, the next station is

2. *Cannanore*, situated at the bottom of a small bay in 11° 51' N. lat., 75° 26' E. long. The fort is built on a jutting portion of land which forms one side of the bay, and is about quarter of a mile distant from the town. The European barracks are situated a few hundred yards west of the fort, and the native barracks, hospital, and lines about a mile and a quarter in rear of it. The European barracks are built of stone, and tiled; they stand on an open plain about 500 yards from the sea, and 30 feet above its level, are of a quadrangular form, and afford ample accommodation for a regiment, but the ventilation is said to be defective.

The town is populous, with close, very filthy streets; it is surrounded by small hills and narrow valleys, free from any extensive reservoirs of stagnant water, but has a few rice fields in the neighbourhood. It is distant 27 miles from the Western Ghauts. The soil is gravelly, composed of the debris of laterite, and scarcely a foot in depth, the substratum being laterite. The cool season commences in November, and lasts to the end of February; the hot season from the beginning of March till towards the end of May; and the rainy from that time till the end of October. In 1836-7 the maximum monthly temperature was 88°, the minimum 67°, and the mean about 78°. The greatest monthly range was 15° in the hot, and the least was 6° in the rainy season, the medium throughout the year being 10½°, and the annual range 21°. The following table shows the monthly fall of rain in inches during three years.

|      | Jan. | Feb. | Mar. | Ap. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Total. |
|------|------|------|------|-----|-----|------|------|------|-------|------|------|------|--------|
| 1835 | ...  | ...  | 4    | 4   | 7½  | 62½  | 12½  | 14½  | 9½    | 14½  | ...  | ...  | 131½   |
| 1836 | ...  | ...  | ...  | ... | 5½  | 46½  | 22½  | 19½  | 16½   | 8    | 6½   | ...  | 123½   |
| 1837 | ...  | ...  | ...  | ... | 11½ | 30½  | 29½  | 11½  | 10½   | 10½  | 14½  | ...  | 118½   |

\* As this term occurs frequently in the following pages, it may be necessary to state for the information of readers unaccustomed to statistical investigations, that the aggregate strength of troops for any period is obtained by adding together the annual strengths for that period; and the average strength at any station may be ascertained by dividing the aggregate by the number of years.

During the rainy season, the air is loaded with moisture to such an extent, that metallic substances immediately corrode, woollen articles become saturated and rapidly destroy, books are deprived of their bindings, articles of furniture fastened with glue fall to pieces, common salt deliquesces, and refined sugar crumbles into powder.

The European troops at Cannanore usually consist of one regiment; the aggregate strength during ten years, 1829-38, amounted to 7959 men, among whom 12,187 admissions into hospital took place, and 300 deaths, being in the ratio of 1531 and 37·7 per 1000 annually. The lowest ratio of admissions was 940 in 1831, and the highest 2237 in 1837, while the mortality ranged from 13·5 in 1830, to 60·7 in 1837. During the last four years of this period the sickness has been considerably above the average, a circumstance attributed by the medical officers to the increase of jungle about the cantonment, and to the greater amount of intemperance among the men. The diseases in which the increase has been most apparent are dysentery, hepatitis, and rheumatism.

The sickness and mortality among the native troops at Cannanore, consisting usually of two regiments, with one company of artillery, are not stated separately, but included with the other stations on the Malabar coast, and will be noticed hereafter.

3. *Calicut*.—This town is situated in 11° 15' N. lat. and 75° 50' E. long., little raised above the sea, and consists of a street about three-quarters of a mile in length, with small cross streets leading from it. The Sepoy lines are on the north-west of the town, and are open to the sea breeze. There are numerous tanks well supplied with water, and the town is well drained. The soil consists of a light brown sand; the climate and seasons are nearly the same as at Cannanore. There are no European troops at Calicut; the native force, in thirteen years, 1829-41, amounted to 2960, the admissions into hospital to 1416, and the deaths to 24, making the ratio of sickness 478, and of mortality 8·1 per 1000 of mean strength.

There is a detachment of 100 native soldiers at Tellicherry, on the coast fifteen miles south of Cannanore, which is said to be remarkably healthy; but no details of the sickness and mortality have been furnished. We have already stated that the returns of the native troops at Cannanore are included along with those from the other stations. By this general return it appears that during ten years, 1829-38, the aggregate strength of native troops employed at all the stations and outposts along this portion of the coast, extending between the 10th and 15th degrees of north latitude, has been 39,743; the admissions have been 22,668, and the deaths 507, giving the respective ratios of 570 and 12·8

per 1000 annually. The same circumstance has occurred among the native troops in this division, as was observed in regard to the Europeans at Cannanore, that during the last five years the amount of sickness and mortality has considerably exceeded the average, from an increase in the cases of fever and rheumatism, for which no adequate reason has been assigned. This negatives the opinion already noticed, which attributes the increased proportion of fever to intemperance, as the native soldier is rarely addicted to this vice. It is obvious that whatever the cause of increase may be, it is one affecting both the European and the Sepoy.

From Calicut, passing southwards, the next station on the coast from which military returns have been furnished, is

4. *Quilon*, in  $8^{\circ} 54'$  N. lat.,  $76^{\circ} 39'$  E. long., built on ground rising by a gentle ascent from the sea to the height of 40 feet. About twenty-five miles east of Quilon is a range of lofty hills, attaining a height of between 2000 and 3000 feet, and covered with thick jungle. From these, numerous mountain streams flow into the back waters or lakes, which extend along and parallel to the coast, communicating in many places with the sea, and affording an important means of transit between the different towns. There are likewise two rivers, one to the south, the other to the north of Quilon, navigable for boats to the distance of twenty miles.

Immediately around Quilon the soil is sandy, but in the interior, which presents a succession of hill and valley, the soil of the low grounds is a rich loam, and, where irrigated by the mountain streams, or along the banks of the rivers and back water, yields abundant crops of rice.

The wet season here commences in the beginning of June, and lasts till the end of October; the average fall of rain being about 120 inches. The highest range of the thermometer in 1835-6 was  $88^{\circ}$  in April and May, and the lowest  $69^{\circ}$  in December and January; the mean annual temperature being about  $81^{\circ}$ .

The native force at Quilon during four years, 1835-8, amounted to 3118, among whom 2159 admissions into hospital and 43 deaths took place, being 69.2 and 13.8 per 1000 of the strength.

Passing round Cape Comorin to the east or Coromandel coast, the next station is

5. *Ramnad*, situated in  $9^{\circ} 23'$  N. lat.,  $78^{\circ} 50'$  E. long. The fort contains 5000 inhabitants, and the town about the same number. The houses are built of mud and thatched. The native troops consist of one company, and reside in houses in the town, there being no separate lines for their accommodation. The country around is an extensive level plain with few trees, and the soil is light and sandy. Although Ramnad is at a dis-

tance of about eight miles from the coast, yet owing to the level nature of the country, it enjoys the full benefit of the sea breeze. The aggregate force employed during ten years, 1829–38, has amounted to 1104 native soldiers, among whom there have been 584 cases and 24 deaths, or in the proportion of 529 and 21·7 per 1000 of the strength.

This high rate of mortality has arisen, as will be subsequently seen, from the ravages of cholera. Had the deaths it caused been deducted, the annual ratio would have amounted to 5·4 per 1000 only, which is a fraction lower than at any of the other stations on the coast.

6. *Negapatam*, the next station to the northward, in 10° 45' N. lat., 79° 50' E. long., is built on an open, level, sandy piece of ground sloping towards the sea, above which it is elevated four or five feet. It is well drained; but at a short distance to the south is a level waste, which is covered with sea water during the monsoon. The surrounding country is open and level.

The barrack for the native troops is an old Dutch house on a dry sandy piece of ground to the west of the town, built of brick and mud, with a tiled roof. Most of the soldiers, however, being married, reside in the town. The aggregate strength during ten years, 1832–41, was 1819, the admissions 279, and the deaths 15, being only 153 per 1000 of the former, and 8·2 of the latter.

7. *Palaveram*, called also the Presidency Cantonment, lies about four or five miles from the coast, on the western side of the Palaveram range of hills, three miles south of St Thomas's Mount. Although the hills intervene between the cantonment and the sea, yet the houses enjoy the benefit of the sea breeze to a considerable extent. The soil in the neighbourhood is sandy, free from jungle, and little cultivated. The barracks and hospitals for the troops are substantial well constructed buildings, on ground sloping gently from the foot of the hills, and well drained. The huts for the men stood between the barracks and the Adyar, about 200 yards in rear of the former; but the ground being swampy, and the huts frequently under water during the monsoon season, from the overflowing of the river, lines were erected on higher ground to the right of the cantonment, and about half a mile from the barracks.

No European troops have been quartered at Palaveram; the aggregate strength of the native force during five years, (1834–8?) amounted to 3961 men, the admissions to 2559, and the deaths to 31, being respectively 646 and 7·9 per 1000 of mean strength.

8. *St Thomas's Mount*, the head quarters of the Madras Artillery, is situated in 13° N. lat., 80° 15' E. long., 8 miles west of

Fort St George, and four or five from the sea, at the base of the eastern and southern sides of the hill from which it is named, and which rises to a height of 840 feet above the level of the sea. The Adyar flows about a mile north of the Mount, forming a considerable river in the monsoon, but becoming almost dry in the hot season. There are numerous tanks in the neighbouring country, from which the land is irrigated for rice cultivation, but no marshes exist near the cantonment, the soil of which consists chiefly of red clay and gravel. The climate is nearly the same as that of Madras, except that the temperature is rather higher in the hot season.

The barracks of the foot artillery are built of brick, and are floored with granite. They run in a direct line north and south, at the bottom of the hill, are open to the sea breeze, and well ventilated. The married men and those allowed to live out of barracks reside in streets of small houses on the base and sides of the hill.

The horse artillery barracks are on the south side of the Mount, built, like the others, of brick, and are commodious and well ventilated. The hospital is a square bomb-proof building, 80 yards distant from the barracks, and calculated to contain 28 men.

The lines of the native foot artillery are situated on the south side of the cantonment; the men are comfortably hutted, and the lines are clean and dry.

The following tabular statement shows the amount of sickness and mortality among the troops: the horse artillery for 9 years, 1829-38, exclusive of 1831; the European foot artillery for 10 years, 1829-38; and the native foot artillery for 9 years, 1829-38, exclusive of 1832.

|                             | Aggregate strength. | Admissions into hospital. | Deaths in hospital. | Ratio per 1000. |       |
|-----------------------------|---------------------|---------------------------|---------------------|-----------------|-------|
|                             |                     |                           |                     | Admitted.       | Died. |
| European Horse Artillery,   | 1721                | 3873                      | 48                  | 2250            | 27·9  |
| ... Foot Artillery,         | 5182                | 7498                      | 125                 | 1447            | 24·1  |
| Native Foot Artillery,..... | 4417                | 1633                      | 61                  | 370             | 13·8  |

9. *Madras*, the capital of the presidency, is situated on the coast, in 13° 6' N. lat., 80° 21' E. long., on a flat sandy plain, very little above the level of the sea. The town within the walls, called Black Town, extends nearly a mile along the beach, and is in some places not more than 6 inches above the level of spring tides; the streets are for the most part irregular, narrow, and ill ventilated. Fort St George lies about half a mile south of Black Town. The town beyond the walls is composed of the villages of Royaporum, Vepery, Chintadrapettah, Poodoopettah, Egmore, Triplicane, Royapettah, and Saint Thomé, occupying altogether



an irregular space of 10 to 12 miles in circumference. The drainage of Madras is bad, chiefly from the difficulty of obtaining a sufficient fall. The principal streets are generally clean and wide, but the back streets are stated, with few exceptions, to be filthy and offensive, especially in Royaporum and Triplicane. There are several localities about Madras where, from the inequalities of the ground, water accumulates during the rainy season, forming extensive shallow ponds or tanks, which become dried up during great part of the year, and are then cultivated as rice fields, or used for grazing cattle. The country around is level and sandy, the nearest hills being St Thomas's Mount, 8 miles to the S. W., and the Pulicat hills, 25 to 30 miles north.

The cool season at Madras extends from November to the end of February, the wind generally blowing from N. E. and E.; the hot season commences in March and continues till the end of May or June, when the rains set in, the prevailing wind being the south or "along shore wind;" and the rainy season lasts from this period till about the middle of November. During the rainy season the land wind generally blows from midnight till 12 or 1 o'clock in the day, when the sea breeze sets in and continues till midnight. About September the sea breeze becomes uncertain, and the winds light and variable till the beginning of October, when the N. E. monsoon is established. The mean temperature ranges between 76° in the cool, and 88° in the hot season.

The European troops are all quartered in Fort St George, at the northern and western extremities of which the barrack is situated; it is of an oblong form, running north and south, and from its construction and the nature of the adjacent buildings, the ventilation is defective; the accommodation is stated to be usually rather limited. The duty of the men consists in the usual routine of drills, guards, and parades, and their diet is said to be unexceptionable in quantity and quality.

The aggregate strength of the European troops during ten years, 1829-38 was 13,981; the admissions into hospital were 26,057; and the deaths in hospital 600, giving the ratio of 1864 of the former, and 42.9 of the latter, per 1000 of the strength.

The native force consists of three regiments, which are huttcd, one at Vepery, the second at Perambore, and a veteran battalion in Black Town.

The lines in Vepery consist of huts built of mud, thatched with Palmyra leaves or straw, and floored with mud mixed with a little chunam. They are each 12 feet by 6, with an enclosure of the same dimensions, are situated immediately to the south of the principal street of the village, and from defective drainage are damp in the rainy season. In their vicinity are several tanks which have been allowed to get into a very offensive state. The

hospital is a substantial brick building at the north end of the lines, raised two feet from the ground, and having verandahs on each side.

The lines at Perambore are three miles N. W. of the fort, and one mile north of those at Vepery, to which they are similar in construction. Their site is only five feet above the level of the sea, and the ground being uneven, becomes marshy in the rainy season; it is chiefly under rice cultivation. The hospital is situated at the end of the lines, built of brick, and raised two feet from the ground; the accommodation is occasionally insufficient for the sick.

The lines of the veteran battalion in Black Town are about a mile and a-half from the fort, within the north wall of the town, in a low but healthy situation. The hospital is a brick building, tiled, and well ventilated.

The duty of the native troops is nearly the same as of the European, but they mount the guards in the more exposed situations. Their diet resembles that of the general native population, consisting chiefly of rice eaten with condiments, or curry. They are much addicted to the use of the beetle nut and of tobacco, but few of them indulge in ardent spirits.

During the ten years, 1829-38, the aggregate strength of the native troops in Madras has amounted to 60,142, among whom 25,944 admissions, and 661 deaths have taken place, being in the ratio of 431 and 11.0 per 1000 of the strength annually.

10. *Masulipatam*, the next station on the coast, lies in 16° 9' N. lat., 81° 12' E. long., about 286 miles north of Madras. The cantonment stands on a low sandy ridge, about two miles from the beach, from which it is separated by a saline marsh, forming in the rainy season a considerable lake: there is also a smaller fresh water marsh behind the cantonment. Beyond these marshes an alluvial plain extends to the foot of the hills, a distance of about 40 miles inland. The fort has been erected in the middle of the larger swamp, on the northern bank of a creek, in the form of an oblong square, surrounded by a wide and deep ditch, and is only five feet above high water mark. The soil on which it stands consists of clay and sand. From the very slight elevation of the ground, the cantonment is very badly drained, and during the rainy season some parts of it remain flooded for weeks. The hot season commences here in March and lasts till the beginning of June; the rainy season then sets in and continues till the end of October; while the cool season extends from November to the end of February. The annual fall of rain is about 35 inches. For a month before the rains begin, there is a regular succession of land and sea breezes; the former very hot and oppressive, the temperature at noon frequently rising to 100°. When

the monsoon is fairly established, the thermometer falls to about  $86^{\circ}$ ; and, during the cool season, the mean temperature at noon ranges from  $65^{\circ}$  to  $76^{\circ}$ . The greatest range observed at this season has been  $24^{\circ}$ ; but the usual average is from  $10^{\circ}$  to  $12^{\circ}$ ; during the remainder of the year it is much less.

The barracks for the European troops are within the fort, substantially built of brick, the floors raised 20 inches from the ground and paved with stone. The lines and hospital of one native regiment are situated on the north-east of the cantonment, and the lines for another regiment on the south-east, on the edge of the salt marsh. The hospital of this regiment stands in the centre of the cantonment. The sites of both lines are dry; but during the rains, pools of water collect near them, which cannot be drained, and are only removed by the gradual process of evaporation and absorption.

Since 1833, no European troops have been quartered at Masulipatam, in consequence of the great amount of sickness and mortality which then occurred in Her Majesty's 62d regiment. From a statement of the admissions into hospital and deaths for some preceding years, we find that during ten years, 1822–32 exclusive of 1825, the aggregate strength amounted to 5110, the admissions to 10,476, and the deaths to 350, being in the proportion of 2050 and 68.5 per 1000 of the strength annually. In 1833, H. M. 62d regiment in nine months had 1337 admissions and 103 deaths, which, calculated upon a strength of 300, (three-fourths of the average annual numerical strength,) give a ratio of 4456 of the former and 343. of the latter. A committee was appointed to inquire into the cause of this frightful amount of disease, but the result does not seem to be satisfactory. They attributed it to the regiment having suffered much from cholera on the march to Masulipatam, and arriving in a state of despondency, which made them very amenable to the influence of malaria, the intense heat of the season that year, the impure state of the ditch, and the defective condition of the drains.\* The

\* The Medical Board, in submitting to Government the table from which these figures are compiled, stated that the ratio of mortality among all the European regiments in the presidency, from January 1813 to December 1819, was 5.690 per cent., while that of the regiments at Masulipatam, from 1813 to 1832 inclusive, was 5.100 per cent. They then add, "The rate of mortality having been somewhat lower than throughout the rest of the presidency for such a period, gives reason to conclude that the station cannot be considered, under ordinary circumstances, as unhealthy." Now the Board appear to have arrived at this conclusion from an error in the mode of calculating the ratio. In several of the years between 1813 and 1832, the regiments were quartered at Masulipatam during part of the year only. It must be obvious to any one conversant with the principles of statistics, that in such a case a proportion of the annual strength only should be taken, corresponding with the period for which the regiment was quartered there. Thus if the period was nine months, the sickness and mortality should be calculated on three-fourths of the strength; if eight months, on two-thirds, and so forth. The Board, however, have made the calculation in every instance on the

station appears on previous occasions to have suffered from severe outbreaks of fever and dysentery, attributable most probably to the unhealthy site on which the fort has been erected.

During ten years, (1830-40, exclusive of 1832,) the aggregate strength of the native troops at Masulipatam amounted to 13,660, who furnished 12,175 cases and 198 deaths, being in the ratio of 891 and 14·5 per 1000 annually, thus showing that this station is unfavourable also to the health of the native soldiers.

11. *Vizagapatam*, in 17° 42' N. lat., 83° 22' E. long., stands in a small bay, about six miles across, which is terminated on the south by a hill called "The Dolphin's Nose," several hundred feet high, and on the north by the village of Waltair. The soil on the higher ground is barren, composed of a reddish gravel; in the lower ground it is a rich loam. The hills approach to within three or four miles of the town, and are covered with low jungle to their summits; many of them are from 1500 to 2000 feet in height. The fort lies in the south-western part of the bay, separated from the Dolphin's Nose by a small river, and contains the barracks for the European veterans. The native town adjoins the fort: beyond the town, and between it and the village of Waltair, are the lines of the native regiment, on the right of which are the barracks and hospital. On the south of the lines is a swamp nine miles in circumference, but which is inundated by the sea at every tide, and on the east is a large tank, which contains water throughout the year. The average monthly temperature ranges from 70° in January, to 87° in May and June. The station is almost completely protected from the land wind by the neighbouring hills. The S. W. monsoon sets in about the first week of June, and continues till the middle of September, after which the north-east rains commence and prevail till the middle of November. The aggregate strength of the native force at this station for 11 years (1829-41, except 1831 and first half of 1832 and of 1841,) amounted to 7320, among whom there occurred 4091 admissions into hospital, and 97 deaths; the former being in the ratio of 559, and the latter of 13·3 per 1000.

The amount of sickness and mortality in the European veteran battalion will be noticed hereafter.

The last station included in this class is

12. *Chicacole*, in 18° 20' N. lat., 84° E. long., on the north bank of the Nagglawdy river, about four miles from the sea, surrounded on the north, east, and west by extensive tracts of rice fields and cotton ground, which are partially irrigated by channels from the river. There are no hills of any consequence nearer than 12 or 13 miles. In the immediate vicinity of the town there are

average annual strength without any such deduction. Had the necessary correction been made, the deaths from 1813 to 1832 would have been found to average 6·394 per cent. annually, instead of 5·100 as above stated.

very few tanks ; but within five or six miles are several of considerable magnitude, covered with rank vegetation, and in the dry season productive sources of malaria. The prevailing winds from April to September are from the S. and S. E., and from October to March from the N. and N. E.

The barracks and hospital are situated within an old mud fort in a ruinous condition, and the ditch of which, having been only partially filled up, contains pools of stagnant water. The regimental lines are about 100 yards to the south-west of the fort, and are open, airy, and regularly built.

In nine years (1830-41, exclusive of 1832 and 4, and the second half of 1833 and 40,) the sickness and mortality among the native troops have averaged 908, and 21·6 per 1000 annually, the admissions having been 5483, and the deaths 131, out of an aggregate strength of 6070 men.

Having thus briefly described the various stations on the coast, and shown the admissions into hospital and deaths at each, we shall proceed to examine by what diseases this amount of sickness and mortality has been occasioned. As it has been impossible, owing to the imperfect system of returns already noticed, to adopt precisely the same classification as that followed in the "Statistical Reports on the Health of the Army," it seems advisable here to state what diseases are comprised in each class in the following pages, and thus to save numerous explanations which would otherwise be necessary.

The same general principles of classification have been followed as in these reports. I. **FEVERS**, under which are comprised *Febris Ephemera*, *F. Intermittens Quotidiana*, *F. I. Tertianæ*, *F. Remittens*, *F. Continua*. II. **ERUPTIVE FEVERS**, including *Variola*, *Varicella*, *Rubeola*. III. **DISEASES OF THE LUNGS**—*Pneumonia*, *Catarrhus*, *Phthisis Pulmonalis*, *Asthma*, *Dyspnoea*. IV. **DISEASES OF THE LIVER**—*Hepatitis Acuta*, *H. Chronica*. V. **DISEASES OF THE BOWELS**—*Dysenteria Acuta*, *D. Chronica*, *Diarrhoea*, *Dyspepsia*, *Obstipatio*. VI. **CHOLERA**. VII. **DISEASES OF THE BRAIN**—*Apoplexia*, *Paralysis*, *Epilepsia*, *Amentia*, *Mania*. VIII. **DROPSIES**—*Anasarca*, *Ascites*, *Beriberi*. IX. **RHEUMATISM** (*Acute and Chronic*). X. **VENEREAL AFFECTIONS**—*Syphilis Primitiva*, *S. Consecutiva*, *Gonorrhoea*, *Hernia Humoralis*, *Stricture Urethrae*. XI. **DISEASES OF THE EYES**. XII. **DISEASES OF THE SKIN**. XIII. **ABSCESSSES AND ULCERS**—*Phlogosis*, *Ulcus*. XIV. **OTHER DISEASES**, including all cases not specified among the preceding.

The following table (TABLE I.) shows the number of admissions into hospital and deaths, with the ratio of these per 1000 of mean strength at the different stations on the sea coast.\*

\* The ratios in this table do not in every case correspond with those stated in the preceding descriptions, as the same period of time is not always included.

| U. S. Statistics |    | 10. Masulipatam. |     | 11. Vizagapatam.     |     | 12. Chicacole.       |     | † Total exclusive of Mangalore & Calicut. |      |
|------------------|----|------------------|-----|----------------------|-----|----------------------|-----|-------------------------------------------|------|
| Period 1-8       |    | 1830-40          |     | 1829-41 <sup>3</sup> |     | 1830-41 <sup>4</sup> |     |                                           |      |
| Strength 53      |    | 13660            |     | 7320                 |     | 6070                 |     | 77504                                     |      |
|                  | D. | Ad.              | D.  | Ad.                  | D.  | Ad.                  | D.  | Ad.                                       | D.   |
| Fever,           | 45 | 7185             | 81  | 1422                 | 16  | 2556                 | 32  | 17204                                     | 240  |
| Eruptive         | 1  | 49               | ... | 47                   | ... | 52                   | 3   | 300                                       | 5    |
| Lung &           | 23 | 146              | 13  | 118                  | 7   | 48                   | 4   | 974                                       | 96   |
| Liver &          | 4  | 7                | 1   | 10                   | 2   | 8                    | ... | 77                                        | 10   |
| Bowel            | 51 | 617              | 34  | 200                  | 10  | 397                  | 11  | 3236                                      | 184  |
| Cholera          | 57 | 13               | 6   | 41                   | 22  | 56                   | 31  | 429                                       | 217  |
| Brain            | 14 | 26               | 4   | 32                   | 6   | 34                   | 2   | 267                                       | 35   |
| Dropsy           | 19 | 182              | 32  | 37                   | 16  | 256                  | 22  | 589                                       | 102  |
| Rheum.           | 14 | 879              | 11  | 456                  | 4   | 496                  | 8   | 4470                                      | 56   |
| Vener.           | 2  | 329              | ... | 325                  | 2   | 130                  | 2   | 1833                                      | 10   |
| Eye dis.         | 5  | 73               | ... | 93                   | ... | 52                   | ... | 676                                       | 5    |
| Skin dis.        | 4  | 794              | 1   | 367                  | ... | 357                  | ... | 4830                                      | 5    |
| Abcess           | 9  | 1139             | 2   | 557                  | 1   | 599                  | 1   | 5967                                      | 21   |
| Other &          | 54 | 736              | 13  | 386                  | 11  | 442                  | 15  | 8209                                      | 176  |
| Total, 5302      |    | 12175            | 198 | 4091                 | 97  | 5483                 | 131 | 49061                                     | 1162 |

<sup>3</sup> Excl. 32 and 1841.

<sup>4</sup> Excl.

† Dysentery "other diseases."

† The

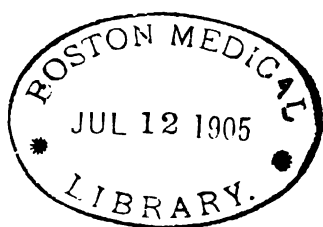
The

|                       | 2. Cannanore. | 11. Vizagapatam. | 12. Chittoor. | Total consisting of Mangalore and Calicut. | Corrected ratio of Totals. | Cavalry in United Kingdom. | Cape Corps (Hottentots.) |
|-----------------------|---------------|------------------|---------------|--------------------------------------------|----------------------------|----------------------------|--------------------------|
|                       | Ad. Died.     | Ad. Died.        | Ad. Died.     | Ad. Died.                                  | Ad. D.                     | Ad. Died.                  | Ad. Died.                |
| Fever, 233            | 2-8           | 194 2-2          | 431 5-3       | 223 3-2                                    | 223 3-1                    | 75 1-4                     | 66 7                     |
| Eruptive 6            | ...           | ...              | ...           | ...                                        | ...                        | ...                        | ...                      |
| Lung dis. 109         | 2-5           | 16 1-1           | 8 7           | 12 1-2                                     | 12 1-2                     | 145 7-4                    | 105 3-9                  |
| Liver dis. 102        | 5-4           | 1 3              | ...           | 1 1                                        | 1 1                        | 5 3                        | 4 5                      |
| Bowel dis. 404        | 23-2          | 27 1-4           | 65 1-8        | 42 2-4                                     | 45 2-6                     | 744 1-4                    | 84 4-1                   |
| Cholera 10            | 2-2           | 6 3-1            | 9 5-1         | 6 2-8                                      | 6 2-8                      | 4 1-2                      | ...                      |
| Brain dis. 16         | 1-4           | 5 8              | 5 3           | 3 5                                        | 4 5                        | 5 6                        | 4 1                      |
| Dropsy 7              | 2-2           | 5 2-2            | 42 3-6        | 8 1-3                                      | 9 1-4                      | 1 2                        | ...                      |
| Rheumat. 136          | ...           | 62 21            | 82 21         | 87 24                                      | 57 27                      | 48 161                     | 67 69                    |
| Ven. affec. 261       | ...           | 13 9             | ...           | 9 9                                        | 10 10                      | 19 29                      | 8 8                      |
| Eye dis. 61           | 6-7           | 50 3-4           | ...           | 62 3-5                                     | 70 3-5                     | 29 2-4                     | ...                      |
| Skin dis. 52          | ...           | 76 98            | ...           | 77 106                                     | 86 132                     | ...                        | ...                      |
| Ab. & ul. 187         | ...           | 53 74            | ...           | ...                                        | ...                        | ...                        | ...                      |
| Other dis. 407        | ...           | ...              | ...           | ...                                        | ...                        | ...                        | ...                      |
| Total, 1984           | 46-4          | 559 13-3         | 903 21-6      | 633 15-3                                   | 633 15-3                   | 929 14-3                   | 833 10-9                 |
| Exclusive of cholera. | 44-2          | ...              | ...           | ...                                        | ...                        | ...                        | ...                      |

\* Included among "..."

† The data being im...

In this column we ... strength out of which the cases occurred having been 60126 instead of 77804.



This table shows the amount of sickness and mortality to have been comparatively high among the European soldiers at Fort St George, probably owing to two adventitious circumstances. First, Madras being the sea port at which troops are commonly landed on their first arrival in the Presidency, the admissions have been increased by slight cases of fever arising from exposure to the sun and the effects of dissipation, in which soldiers are too apt to indulge on landing after a long voyage. And, secondly, from it being the port of embarkation for invalids, the proportion of deaths has been raised by fatal cases occurring among them while waiting an opportunity of returning to England. The ratio of mortality has also been greatly increased by the ravages of cholera, which has caused upwards of a fifth of the whole deaths at the station. If we deduct the fatal cases of this disease, of whose course and cause we are still so completely ignorant, Fort St George will be found to hold an intermediate place between Cannanore and St Thomas's Mount.

We regret that the returns relative to Masulipatam do not enable us to classify the diseases as in the preceding table, but, referring to the description of that cantonment, it will be seen that the proportion of deaths is upwards of a fourth higher than at any of the other stations for European troops on the coast. This excess is stated to have been caused chiefly by fever and dysentery, the greater prevalence and intensity of which are accounted for by the position of the fort, in the centre of an extensive marsh, above the surface of which it is elevated but a few feet.

On examining the relative proportion of admissions and deaths by each class of diseases among the Europeans, it will be seen that fevers and diseases of the bowels furnish a third of the admissions, and that the latter and inflammation of the liver are the cause of half the deaths. To the prevention of these three classes, therefore, the attention of medical officers in India should be particularly directed. Fevers, although from their prevalence a source of considerable inefficiency, are by no means very fatal, the proportion of deaths not greatly exceeding that among troops in this country, and being even a fraction under that of the Sepoys at the same stations. In this respect there is a striking contrast between the East and West Indies; fevers in the latter occupying the most prominent position both as regards admissions and deaths. Inflammation of the liver, however, is comparatively a rare disease, and productive of little loss in the West Indies, while in the East it gives rise to a large proportion of sickness and mortality. The troops appear by the above table to enjoy a remarkable exemption from diseases of the lungs compared with any of the



places of which the statistics have been investigated, a subject to which we shall hereafter more fully advert.

To enable us to compare the amount of disease and its effects upon the native soldier in India, with other troops serving in their native country, we have annexed to the preceding table the ratios of sickness and mortality among the cavalry in the united kingdom and the Cape mounted rifles, (Hottentots,) being the only available information on the subject.\* The results show a most extraordinary uniformity in the mortality, which amounts to 15 per thousand for the Sepoys, 14 per thousand for the cavalry at home, and 11·9 for the Cape corps; or, deducting epidemic cholera, to 12·8 at home, 12·2 in Madras, and 10·9 at the Cape. The ratio of sickness among the Sepoys was considerably increased by the employment in the end of 1835 of a body of 7000 men in Goomsoor, where they suffered greatly from jungle fever of a severe type, and which, on their return, increased the amount of disease at the posts where they were stationed. We are unable to ascertain to what extent this cause operated, or what stations it especially affected; it may be sufficient to state that in the northern (military) division, from which the force was drawn for that service, the admissions rose in 1836 to considerably more than double, and the deaths to treble the usual average; indeed, the latter were more than double the highest ratio in any of the other years from 1829 to 1838.

The class of diseases which has been the most prevalent and most fatal has been fevers, for which, on the aggregate of the stations on the coast, 222 were admitted, and 8·1 died per 1000 of the strength. But this has been materially affected by the stations of Masulipatam and Chicacole. The former we have already pointed out as very unhealthy, both for European and native troops, surrounded as it is with all the supposed sources of malaria; the latter appears to have been one of the stations, the garrison of which suffered severely from the effects of the Goomsoor campaign. Omitting these two stations, the admissions by fevers would amount only to 129, and the deaths to 2· per 1000 of the strength, which, however, are higher ratios than in the united kingdom, or among the native troops at the Cape.

The next class of diseases in point of importance has been those of the bowels, which has caused 45 admissions and 2·6 deaths per 1000. The ratio appears remarkably low in a country where, among Europeans, this class of diseases occupies so prominent a

\* These ratios have been calculated from the abstracts in the statistical reports on the health of the army; care has been taken to include in each class only such diseases as are comprised under the same head in the returns of the Madras native troops. It is almost unnecessary to observe that the ratios consequently do not correspond with those published in the reports.

place ; but the constitution of the Indian and the nature of his diet no doubt tend to his exemption.

Cholera has proved a source of considerable mortality, and has displayed, as usual, great irregularity in its prevalence at different stations, the deaths varying from 0·3 at Mangalore to 16·3 per 1000 at Ramnad. It has, however, fully maintained its fatal character, 217 out of 429 cases having died.

The exemption from diseases of the lungs which we remarked in the case of the Europeans, has been enjoyed to a still greater extent by the native troops, among whom also diseases of the liver, which were a source of considerable sickness and mortality among the former, are of very rare occurrence.

Beriberi, included in the class of dropsies, deserves especial notice, as having been almost entirely confined to Masulipatam, Vizagapatam, and Chicacole. The admissions at the first of these stations were 130 and the deaths 22, at the second 21, of whom 6 died, and at the last 243 and 16 deaths. Beriberi is chiefly confined to situations near the coast, being rarely seen on the high lands, and is supposed to be of malarious origin, which derives corroboration from its great prevalence at Masulipatam and Chicacole, where the troops were more exposed to that cause of disease than at any of the other stations : it is seldom met with in Europeans.

Reserving our farther remarks on the diseases of the troops till we have considered those in the other divisions, we now proceed briefly to describe,

## II. *The Stations on the Plains between the sea coast and mountain ranges.*

1. *Palamcottah*, the most southerly station in this class, is situated in 8° 48' N. lat., 77° 48' E. long., on an extensive plain one mile east of the Tanjavar river, at a height of about 120 feet above the level of the sea. The fort stands on a bed of granite, slightly elevated, and for the most part bare of soil. Immediately to the northward are some tanks for irrigating the low grounds. Abundance of water for domestic use is found in the fort at a depth of from 8 to 12 feet. The European artillery barrack is built on the most elevated ground within the fort, and consists of a commodious house with several large airy rooms. The force amounts to 20 men, who have been generally healthy.

The native lines are outside the fort, on an elevated rocky situation. The aggregate strength of the regiment stationed here for 10 years, 1829–38, has been 8094, out of which 3451 admissions and 93 deaths have taken place, being in the proportion of 426 and 11·5 per 1000 annually.

No details are given of the European artillery, nor from the smallness of the force could any satisfactory deductions have been drawn therefrom.

2. *Madura*, situated in  $9^{\circ} 55'$  N. lat.,  $78^{\circ} 11'$  E. long., is a town with a population of 30,000 inhabitants, about 60 miles in a direct line from the sea, and 600 feet above its level; it is enclosed by a wall, and surrounded by a deep ditch. The houses are chiefly built of mud; in the northern part of the town they are large and comfortable; in the southern they are dirty, crowded, and of an inferior description. There are no Sepoy lines, the soldiers living in the south-west corner of the town with the inhabitants. They are stated to keep their houses and the neighbouring streets clean. During ten years, 1829–38, the admissions were 639, and the deaths 20, out of an aggregate strength of 1542, being in the ratio of 414, and 13.0 per 1000 respectively.

3. *Dindigul* is situated in  $10^{\circ} 22'$  N. lat.,  $78^{\circ} 2'$  E. long., in the middle of a plain 25 miles in extent from north to south, and 30 from east to west, surrounded by hills, and about 700 feet above the level of the sea. Five miles south of the town a range of hills, called the Serroo Mullays, rise to the height of about 3500 feet, while the Pulneys, 20 miles west of Dindigul, rise to double that height. On the west side of the town is a remarkable fortified rock 400 feet in length, 300 wide, and 280 feet high, composed of gneiss veined with felspar, and nearly bare of vegetation. It is ascended on the east side by a flight of stone steps; the other sides are perpendicular. The town stands on a gentle slope, the streets are wide, and the houses well built. The Sepoy lines are at the N. W. corner of the town, on the highest part of the slope, and are well drained, dry, and clean. The soil consists principally of a light and dark ferruginous earth lying upon gneiss; and although rice is cultivated near tanks and rivers, the chief product of the district is dry grain. The thermometer in May ranges from  $79^{\circ}$  to  $98^{\circ}$ , and in December and January from  $66^{\circ}$  to  $80^{\circ}$ . The rains commence in July, and continue at intervals till February. The nights are always comparatively cool. The aggregate strength of the troops during 1833–5–6, and the first half of 1838, amounted to 2255, and furnished 1609 cases, and 19 deaths, being in the ratio of 713 and 8.4 per 1000. Dindigul having been only occasionally occupied by troops, the returns are not available, except for the above years.

4. *Paulghaut* is situated in a gap in the Western Ghauts, in  $10^{\circ} 46'$  N. lat.,  $76^{\circ} 43'$  E. long., at a distance of 45 miles from the Malabar coast, and 800 feet above the level of the sea. The surrounding country is undulating to the foot of the hills, which are

distant 7 miles to the north, and 13 to south ; westwards there is a gradual descent towards the sea. The Canady, a river of considerable size, runs about two miles to the north, and the Calpathy, which in the summer is nearly dry, about a mile to the south. Their beds are in some places rocky, in others consist of white sand. There are no tanks in the neighbourhood, but several morasses are to be found at the foot of the hills. The soil around Paulghaut is light and productive, and is highly cultivated ; the high grounds consist of red gravel and laterite.

The cantonment stands on slightly undulating and open ground, having the fort, a square fortification, surrounded by a wet ditch 21 feet deep and 15 broad, at the south-east corner. The native lines lie 408 yards north of the fort, consisting of a main street running north and south, 25 feet wide, crossed at right angles by eight streets 15 feet wide, and which are kept clean and well drained. The aggregate strength of the troops during eight years, 1829–38, exclusive of 1832 and '34, was 3896 ; the admissions amounted to 3274, and the deaths to 42, being in the proportion of 840 per 1000 of the former, and 10·8 of the latter.

5. *Trichinopoly* is situated in 10° 50' N. lat., 78° 44' E. long., on the south bank of the Cauvery, 85 miles distant from, and about 250 feet above, the level of the sea. The fort is two or three furlongs from the south-west bank of the river, surrounded by strong walls of solid masonry, in some places double, and from 30 to 40 feet in height. They inclose a native town having a population of 30,000 inhabitants, the houses and huts being generally low, narrow, closely placed together, and having no windows. The flag-staff is placed on the summit of a rock of granite, within the fort, about 500 feet in height, called "The Rock of Trichinopoly." The country around is irrigated in every direction for the cultivation of rice, except to the southward, where the ground is too high to permit it. The soil on the high grounds is rocky, sandy, or gravelly, and of little depth. On the low grounds it is rich and highly productive ; in many places near the fort it is a deep black loam, and yields three crops annually. The soil in the low grounds has generally a bottom of deep stiff tenacious red clay with an intermixture of sand.

The mean annual fall of rain does not exceed 30 or 40 inches, and occurs chiefly from August to November ; during the remaining eight months, the weather is usually hot and dry, often attended with high winds in May, June, and July. The mean annual temperature at this station is 85½° ;\* the greatest heat observed in the shade being 102° and the lowest 68°.

\* In the preparation of this Report we have implicitly followed the statements in the official documents ; but we think it right to observe that this appears remarkably high as a mean annual temperature.

The military cantonment stands on a plain from two to three miles south-west of the fort. The force consists usually of one of H. M. regiments of foot, one company of European artillery, one native cavalry, and four native infantry regiments. The artillery barrack is a spacious, lofty, well ventilated brick building at the western extremity of the cantonment, in an airy and well-raised situation, and affording accommodation for 100 men. A stream of water runs within 200 yards of it, in which the men bathe throughout the greater part of the year. The huts for the married men with their families are defective in size, comfort, and ventilation. The European infantry barracks are half a mile to the eastward of this, built of brick, forming a quadrangle, and calculated for 800 men. They face to the south, and have a spacious gravelly parade in front. The hospital is a lofty well-ventilated building, about 350 yards from the barracks, on the south-west side of the parade, and having an eastern aspect. It scarcely affords sufficient accommodation in sickly seasons.

The cavalry lines are in the centre of the cantonment, near a stream of water; the hutting ground for the men being to the eastward of the horse lines.

The lines for two of the native regiments of infantry are situated at the north-west extremity of the cantonment. The huts form straight, wide, and regular streets, but are said to be too close and crowded, and less healthy than the other lines. The hospitals are described as small, ill ventilated, and low roofed. The lines of the other two regiments form the south-eastern extremity of the cantonment, a mile and a-half apart from the last, and separated from them by a small stream which flows in a tortuous course through the cantonment. The barracks face the south, and stand on an open level plain with a rocky bottom and gravelly surface. The hospitals are 300 yards in rear, raised three feet above the ground, floored with stone, and have compounds round them inclosed by a wall. The Sepoy lines are to the eastward of the hospitals; the huts are of a superior description, and form wide and regular streets, well ventilated, and kept very clean.

The aggregate strength of the European troops at Trichinopoly during ten years, 1829-38, has been 8922, the admissions into hospital have amounted to 15,144, and the deaths to 351. These numbers give a ratio of 1697 and 39.3 per 1000. The admissions have ranged between 1352 in 1830, and 2090 in 1835, and the mortality from 23.9 in 1836 to 78.4 in 1832. The latter ratio, however, was caused by a fatal epidemic of cholera; but for which it would have amounted only to 32.7. The highest mortality, except in 1832, was 48.2 in 1833.

The sickness and mortality among the native troops at Trichinopoly are not stated separately from the other stations in the southern division, and cannot in consequence be made use of in the present report.

6. *Combacorum* is situated in  $10^{\circ} 58'$  N. lat.,  $79^{\circ} 29'$  E. long., at a distance of thirty miles from the sea, in a rich alluvial plain, and close to the Cauvery and Asillar rivers. The surrounding country is extensively irrigated and chiefly under rice cultivation, of which it yields two crops annually. The Sepoy lines, consisting of seventy or eighty huts, are on the bank of the river. The aggregate strength in the ten years 1829–38, was 629 men, among whom 395 admissions and 8 deaths occurred, being in the ratio of 628 and 12.8 per 1000 of the strength.

7. *Coimbatore*, situated in  $10^{\circ} 59'$  N. lat.,  $76^{\circ} 59'$  E. long., at a height of 1483 feet above the level of the sea, is a neatly built town, with wide well-ventilated streets. It is distant about five miles from the hills, and fifteen from the nearest tract of jungle. The climate is much influenced by the winds, which blow through the Paulghaut pass. The north-east monsoon commences about the middle of October. The rains which accompany it cease in the end of December; but the wind prevails with little variation till the end of March, constituting the cool season. From this period till the middle of May the wind is generally from the south or south-east. Westerly winds then set in, bringing on the hot season, during which the thermometer frequently rises to  $96^{\circ}$  and  $98^{\circ}$  in the shade, and rarely falls below  $79^{\circ}$ . After the south-west monsoon is established on the Malabar coast, the heat is a little moderated; but the westerly winds continue till September, when the air is often close and sultry, and the winds become variable. From the beginning of June till the end of August the west wind blowing through the funnel formed by the Paulghaut pass sweeps over the adjoining country with great violence.

The Sepoys' huts at Coimbatore are situated close to the town. The aggregate strength of the detachment in seven years, 1832–8, amounted to 878, the admissions into hospital to 566, and the deaths to 9; being in the proportion of 644 and 10.2 per 1000 of the strength annually.

8. *Salem*, in  $11^{\circ} 39'$  N. lat.,  $78^{\circ} 12'$  E. long., lies in the lowest and narrowest part of a valley about seven miles in width, at a height of 907 feet above the level of the sea, from which it is 100 miles distant in a direct line. The hills enclosing the valley terminate about five miles from Salem in an easterly direction; westwards the country is generally open, with the exception of occasional small insulated hills. The Tyromany river forms the northern and western boundaries of the town. Three dams have

been erected across the stream near the town, in the vicinity of which the river occasionally, during the rains, overflows its banks, but without injury to the town, which is well raised above them. There are numerous tanks in the surrounding country which are filled during the monsoon, but become dry between December and March or April. Irrigation is much practised, and cotton, tobacco, and indigo are cultivated to a considerable extent in the district, as well as the ordinary grain crops. The Sheevaroy hills, which approach within five miles of Salem, attain a height of 4190 feet above the level of the town, but their general height may be estimated at 3500 feet.

The prevailing winds are N. E. from the beginning of November till the end of February, when they become variable, but chiefly from S. and S. W. in April and May. From June till October the S. W. monsoon blows steadily, accompanied with frequent and heavy showers; in October the wind again becomes variable till the setting in of the N. E. monsoon, which in November and December brings with it the periodical rains. The range of the thermometer is very considerable at this station, in February and March amounting to as much as 30°.

No account is given of the accommodation for the troops, but it is probable that they reside in the town, occupying the same description of thatched mud houses as the lower classes of the inhabitants. During 10 years, 1829–38, the aggregate strength of the detachment has been 2440; the admissions have amounted to 800, and the deaths to 64; giving the ratios of 328, and 26·2 per 1000 annually.

9. *Arcot* lies in 12° 54' N. lat., 79° 24' E. long., 68 miles south-west from Madras, at a height of 558 feet above the sea. It is situated upon high ground, sloping towards the left bank of the Palar river, from which it is 900 yards distant; the nearest hills of any importance are seven miles to the south-west of the cantonment.

The surrounding country is gravelly, and free from luxuriant vegetation, except along the banks of the river, where there are tracts of low irrigated rice fields. About half a mile south-west of the town is a strip of land a mile in length, and 400 yards in breadth, along the bank of the river, thickly planted with mango, date, tamarind, and other trees; there is no jungle within many miles. The bed of the river is sandy; its waters deposit no mud, and during the greater part of the year form a very small stream.

There is accommodation for one European and two native cavalry regiments, but none of the former have been quartered at Arcot for many years past. The lines for the horses are placed parallel to each other, and in advance of the centre is the Euro-

pean barrack, built of brick, and having a tiled roof and brick floor. About 400 yards in rear of the lines are three commodious well ventilated hospitals. The lines for one native regiment are on the right of the cantonment, those for the other being on the west side of the village, which is situated between the cantonment and the banks of the river.

The aggregate strength of the force at Arcot during ten years, 1829–38, has been 7965 cavalry soldiers, among whom the admissions into hospital were 5025, and the deaths 69, being in the proportion of 63 $\frac{1}{2}$ , and 8·7 per 1000 annually.

10. *Vellore* lies 12 miles west of Arcot, in 12° 55' N. lat., 79° 12' E. long. The fort is three quarters of a mile from the foot of a high range of rocky hills, the skirts of which are planted with palm and date trees, and is surrounded by a broad ditch of considerable depth. The village is situated between the fort and the range of hills, is clean, and tolerably airy, and sufficiently elevated to prevent the lodgment of water. The country around is an extensive plain, surrounded by hills, and well watered by the Palar and by numerous springs. The soil is a rich dark mould, producing abundant crops of rice and tobacco. Around the village there is much natural vegetation, and numerous trees which tend to impede the free circulation of air.

The barracks and hospitals are built within the fort; the Sepoy lines are placed about a quarter of a mile to the north of it, and many of the men reside in the village. The regiments quartered here furnish small detachments to the neighbouring civil stations of Chittoor, Chingleput, and Cuddalore, and the sick of these are included in the head quarter returns. There have been no European troops at this station. The aggregate strength of the native force during ten years, 1829–38, has been 12,433, of whom 5263 have been admitted into hospital, and 111 have died, being in the ratio of 423, and 8·9 per 1000 annually.

11. *Rajahmundry*, situated in 17° N. lat., 81° 50' E. long., 28 miles from the sea, on somewhat elevated ground, on the left bank of the Godavery, consists of one principal street, running north and south, and about half a mile in length, with narrow streets and lanes branching off. The river here has high banks, is about a mile in breadth during the rainy season, but the rest of the year it is a small stream, generally fordable. Its waters after the rains deposit a large quantity of mud. The rainy season extends from the middle of June till October, when the N. E. monsoon sets in. During the month of March the sea breeze is felt at this station for a few hours in the afternoon.

The fort is built to the north of the town, in the form of a square, having high mud walls, and surrounded by a ditch, now



partially filled up. The barrack is a long mud building, with tiled roof, in the south-east corner of the fort. The hospital is a building of similar construction, on the west side of, and close to the barrack. The lines for the Sepoys are immediately in front of the barrack, and consist of four rows of thatched huts of a very inferior description.

The country north and south of the town is low, and the soil consists of black cotton ground, chiefly under rice cultivation; to the eastward it rises gradually, and is sandy, barren, and covered only with a low stunted jungle. The detachment, usually two companies, is furnished by the regiment at Samulcottah, and is changed every three months. The aggregate strength during 13 years, 1829–41, has amounted to 2223; the admissions have been 717, and the deaths 29; the former being in the ratio of 322, and the latter of 13·0 per 1000 annually.

12. *Samulcottah* is situated in  $17^{\circ} 4' \text{ N. lat.}, 82^{\circ} 14' \text{ E. long.}$ , at a distance of 8 miles from the sea, above the level of which it stands about 70 or 80 feet, and of 30 miles from the foot of the Eastern Ghauts, which rise to a height of 2000 feet.

The fort was levelled to the ground in 1835, in consequence of the offensive state of the ditch, which was at the same time filled up. The cantonment stands on the N. W. side of the town; there are no lakes or rivers of any importance near it, and but few tanks in the neighbourhood; these are generally dried up in the hot season. The soil is alluvial, resting on a bed of gravel, at a depth varying from 6 to 20 feet.

The barracks have been built of brick, on hard gravelly and elevated ground at the south side of the cantonment. The Sepoy lines are laid out to the S. W. of the barracks on gradually rising ground, beyond which is an open plain for some distance. The hospital is situated on the east of the cantonment in a low and objectionable situation, and is too far distant from the men's lines and barracks; it is built of brick with a tiled roof.

The admissions into hospital and deaths during ten years, (1831–41, exclusive of 1832,) have been 3923 and 78 out of an aggregate force of 7613; the former being in the ratio of 515, and the latter of 10·2 per 1000 of mean strength.

13. *Vizianagram*. This cantonment stands on ground sloping to the northward, in  $18^{\circ} 3' \text{ N. lat.}, 83^{\circ} 35' \text{ E. long.}$ , at a distance of 12 miles from the sea, and six from several ranges of hills rising from the Eastern Ghauts, and bare, with the exception of a few stunted patches of underwood. The fort and village are about a mile from the cantonment, and separated from it by a large tank which contains water throughout the year. The soil around the station is a deep alluvium, and is almost en-

tirely under cultivation. The weather in April and May is very hot and oppressive, the thermometer often standing as high as 96° during the night—but in the winter months the weather is cool and bracing.

The barracks are built in front of the parade ground, facing the south. On their west side are the officers' quarters, and on the east the hospital, which is a large well constructed building of brick, raised six feet from the ground and surrounded by a wall.

The aggregate strength of the force quartered here during ten years, (1829–40, exclusive of 1830 and 1831,) amounted to 13,053 men, among whom 11,721 admissions and 281 deaths took place, being in the ratio of 898 and 21·5 per 1000 respectively.

14. *Berhampore* is situated in 19° 20' N. lat., 84° 55' E. long., on a rocky ledge of ground, surrounded by an extensive plain bounded on the west and north by a range of hills at a distance varying from 5 to 10 miles. The soil of the cantonment is dry and gravelly, and the ledge is of an average height of about 40 feet above the level of the plain. There are no rivers in the vicinity, but there are numerous small tanks on the plain, and several nullahs, which are quite dry except during the monsoon, when they become rapid streams. The hot season extends from the end of March to the end of May, when the thermometer ranges from 75° to 90°; from November to February it ranges from 50° to 75°.

The native lines consist of thatched mud huts, and are open, spacious, and comfortable. On their northern side is the native town, and immediately beyond it a strip of paddy land, and a considerable swamp extending to the foot of the hills.

The ratio of sickness and mortality during eleven years, (1829–41, exclusive of 1831–2,) has amounted to 600 and 15·7 per 1000, the admissions having been 5704, and the deaths 149 out of an aggregate strength of 9505 men.

15. *Russelcondah* is situated in 20° N. lat., 84° 40' E. long., at an elevation of about 150 feet above the level of the sea. It lies at the foot of a hill; the soil of the plains is alluvial, and for some miles round the cantonment they are under rice cultivation. The surrounding country is hilly, the hills varying from 500 to 2000 feet in height. Two small rivers pass the station, and unite about six miles below it; in the hot season they are dried up, but in the monsoon occasionally overflow their banks. The south-west monsoon sets in about the middle of June, and continues till the middle of October. During March, April, and May, the weather is hot, and the nights oppressive, but it is comparatively cool and pleasant during the rest of the year.

The barracks are situated near the foot of the hill and front to the east. The hospital is in a parallel line with them, is commodious, well ventilated, and has verandahs round it. Both buildings are of brick, and tiled. The Sepoy lines are built on the left bank of one of the rivers already noticed. The cantonment has only been occupied since 1836, after the termination of the Goomsoor campaign. The aggregate strength of the force during five years, 1837-41, has amounted to 4351, out of which 3724 admissions and 66 deaths have occurred, being in the proportion of 856 and 15·1 per 1000 annually.

Having thus briefly described the various stations occupied by troops on the plains between the sea coast and the mountain ranges, we shall now submit the following table, (TABLE II.) showing the amount of sickness and mortality at these stations by the different classes of diseases.

This table shows the sickness and mortality among the European troops at Trichinopoly to have been rather less than the average of the stations on the sea coast. If we deduct the deaths by cholera, which, from the irregularity of its visitations, and in the amount of mortality to which it gives rise on different occasions, may fairly be omitted in estimating the influence of the climate, we find a remarkable similarity in the ratios, being respectively 32·4 and 33·3 per thousand. The classes of diseases, however, by which the admissions and deaths have been produced are somewhat differently distributed, fevers having been more prevalent and fatal at Trichinopoly than at the coast stations, probably owing to the extent to which irrigation is carried around it, and the consequent artificial production of marsh; while it has enjoyed a considerable exemption from diseases of the bowels; and also, though not to so great an extent, from inflammation of the liver. The comparative immunity from diseases of the lungs which we formerly noticed is enjoyed to quite as great an extent at this station, being only a very small fraction above that from pneumonia and catarrh alone among the cavalry in the united kingdom, and less than a third of that from the whole of the diseases of this class.

Among the native troops the admissions have ranged from 321 at Rajahmundry to 898 at Vizianagrum, and the deaths from 8·4 at Dindigul to 26·2 at Salem; or, excluding cholera, from 3·9 at Arcot to 18 at Salem; the average of all the stations giving 609 admissions, and 13·5, or, excluding cholera, 9·9 deaths per 1000 of the strength. The comparatively high ratio of sickness and mortality at Vizianagrum, and also at Berhampore and Russelcondah, may probably have been in a considerable degree produced by the Goomsoor campaign. As we have already stated when speaking of the mortality at Chicacole, the returns

TABLE II.—Showing the principal Classes of Diseases among the Troops at the Stations on the Plains.

| European Troops. |                  |                 |            | Native Troops. |                      |                |                |           |           |              |                  |                      |                      |                      |                  |       |      |     |      | Total of native troops. |      |     |      |     |      |      |      |     |      |      |       |       |      |    |
|------------------|------------------|-----------------|------------|----------------|----------------------|----------------|----------------|-----------|-----------|--------------|------------------|----------------------|----------------------|----------------------|------------------|-------|------|-----|------|-------------------------|------|-----|------|-----|------|------|------|-----|------|------|-------|-------|------|----|
| Stations.        | 5. Trichinopoly. | 1. Palamcottah. | 2. Madura. | 3. Dindigul.   | 4. Pailghaut.        | 6. Combaconum. | 7. Coimbatore. | 8. Salem. | 9. Arcot. | 10. Vellore. | 11. Rajahmundry. | 12. Samulcottah.     | 13. Vizianagrum.     | 14. Berhampore.      | 15. Russelcoteh. |       |      |     |      |                         |      |     |      |     |      |      |      |     |      |      |       |       |      |    |
| Period.          | 1834-8           | 1829-38         | 1829-38    | 1833-5<br>-6-7 | 1829-38 <sup>1</sup> | 1829-38        | 1832-8         | 1829-38   | 1829-38   | 1829-38      | 1829-41          | 1831-41 <sup>2</sup> | 1829-40 <sup>3</sup> | 1829-41 <sup>4</sup> | 1837-41          |       |      |     |      |                         |      |     |      |     |      |      |      |     |      |      |       |       |      |    |
| Strength.        | 4502             | 8094            | 1542       | 2255           | 3896                 | 629            | 878            | 2440      | 7965      | 12433        | 2223             | 7613                 | 13053                | 9505                 | 4331             | 76877 |      |     |      |                         |      |     |      |     |      |      |      |     |      |      |       |       |      |    |
| Fever,           | 1672             | 28              | 1047       | 13             | 163                  | 3              | 430            | 4         | 447       | 9            | 158              | 2                    | 220                  | 3                    | 197              | 5     | 1225 | 8   | 1497 | 27                      | 259  | 13  | 1298 | 22  | 5583 | 73   | 2364 | 34  | 1866 | 16   | 16754 | 232   |      |    |
| Erupt. do.       | 1                | ...             | 34         | ...            | 13                   | ...            | 28             | ...       | 36        | 1            | 1                | ...                  | 5                    | ...                  | 5                | ...   | 68   | 7   | 63   | 7                       | ...  | 4   | ...  | 83  | 4    | 130  | ...  | 47  | 3    | 104  | 1     | 490   | 9    |    |
| Lung dis.        | 389              | 10              | 42         | 7              | 9                    | ...            | 33             | 3         | 101       | 3            | 6                | 1                    | 4                    | 1                    | 23               | 5     | ...  | 58  | 6    | 16                      | 16   | ... | 58   | 6   | 168  | 16   | 78   | 9   | 42   | 5    | 711   | 70    |      |    |
| Liver dis.       | 481              | 15              | 7          | ...            | ...                  | ...            | 2              | ...       | 5         | 1            | ...              | 2                    | ...                  | 2                    | 1                | ...   | ...  | ... | ...  | ...                     | ...  | ... | ...  | ... | ...  | ...  | ...  | ... | ...  | ...  | ...   | ...   | ...  |    |
| Bowel dis.       | 822              | 58              | 247        | 12             | 77                   | 3              | 95             | 2         | 322       | 8            | 82               | 1                    | 56                   | 2                    | 73               | 3     | 207  | 43  | 137  | 12                      | 29   | ... | ...  | 198 | 10   | 696  | 26   | 378 | 22   | 176  | 6     | 2723  | 110  |    |
| Cholera.         | 24               | 11              | 78         | 37             | 17                   | 11             | 3              | 8         | 14        | 8            | 5                | 3                    | 9                    | 2                    | 35               | 20    | 91   | 38  | 44   | 23                      | 22   | 9   | ...  | 26  | 9    | 144  | 58   | 64  | 28   | 63   | 27    | 615   | 276  |    |
| Brain dis.       | 65               | 10              | 19         | 3              | 7                    | ...            | 12             | 3         | 7         | ...          | 2                | ...                  | 1                    | ...                  | 13               | 6     | ...  | ... | ...  | ...                     | ...  | 1   | ...  | 23  | 3    | 37   | 6    | 25  | 6    | 13   | 1     | 160   | 28   |    |
| Dropsies.        | 14               | 1               | 10         | 4              | 2                    | ...            | 5              | 2         | 14        | 1            | 4                | 1                    | ...                  | ...                  | 35               | 20    | ...  | ... | ...  | ...                     | ...  | 49  | 5    | 105 | 14   | 438  | 54   | 123 | 18   | 29   | 4     | 816   | 124  |    |
| Rheumat.         | 508              | 5               | 306        | 1              | 51                   | 3              | 147            | 1         | 299       | 4            | 32               | 29                   | ...                  | ...                  | 83               | 3     | 261  | 2   | 734  | 6                       | ...  | 88  | ...  | 456 | 2    | 1047 | 15   | 548 | 8    | 331  | 1     | 4412  | 46   |    |
| Venerl. aff.     | 1789             | 6               | 153        | ...            | 43                   | ...            | 71             | ...       | 123       | ...          | 15               | ...                  | ...                  | ...                  | ...              | ...   | ...  | ... | ...  | ...                     | ...  | 74  | ...  | 286 | 1    | 432  | 5    | 252 | 3    | 117  | 3     | 1627  | 12   |    |
| Eye disease.     | 334              | ...             | 101        | ...            | 27                   | ...            | 165            | ...       | 222       | ...          | 18               | ...                  | ...                  | ...                  | 26               | ...   | ...  | ... | ...  | ...                     | ...  | 8   | ...  | 54  | ...  | 161  | 1    | 65  | ...  | 60   | ...   | 934   | 1    |    |
| Skin dis.        | 81               | ...             | 165        | ...            | 593                  | ...            | 80             | ...       | ...       | ...          | ...              | ...                  | ...                  | ...                  | ...              | ...   | ...  | ... | ...  | ...                     | ...  | 16  | ...  | 336 | ...  | 758  | 1    | 402 | ...  | 157  | ...   | 2644  | 1    |    |
| Abs. & ulc.      | 635              | 2               | 890        | ...            | ...                  | ...            | ...            | ...       | ...       | ...          | ...              | ...                  | ...                  | ...                  | ...              | ...   | ...  | ... | ...  | ...                     | ...  | 52  | ...  | 462 | 1    | 1225 | 5    | 725 | ...  | 6    | 486   | ...   | 3840 | 12 |
| Other dis.       | 1353             | 11              | 352        | 15             | 208                  | ...            | ...            | ...       | ...       | ...          | ...              | ...                  | ...                  | ...                  | ...              | ...   | ...  | ... | ...  | ...                     | ...  | 99  | 2    | 535 | 4    | 884  | 17   | 623 | 8    | 279  | 2     | 11026 | 103  |    |
| Total.           | 8168             | 1579451         | 93         | 639            | 20                   | 1609           | 193274         | 42        | 395       | 8            | 566              | 9                    | 800                  | 64                   | 5025             | 69    | 3263 | 111 | 717  | 29                      | 3923 | 78  | 1172 | 281 | 5704 | 149  | 3734 | 66  | 4681 | 1038 |       |       |      |    |

\* Included with "other diseases."

† Dysentery and diarrhoea only are included.

¹ Exclusive of 1832 and 4.

² Exclusive of 1830 and 31.

³ Exclusive of 1831 and 32.

TABLE II.—Continued. Ratio per 1000 of mean strength.

| Stations on the Plains. | NATIVE TROOPS.       |                      |                       |                       |                       |                       |                       |                       |                       |                       |                      |                      |                      |                      |                       |                       | Total correct- ed.†   |     |     |     |     |     |      |     |      |     |      |     |      |      |      |      |     |
|-------------------------|----------------------|----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------------|----------------------|----------------------|----------------------|-----------------------|-----------------------|-----------------------|-----|-----|-----|-----|-----|------|-----|------|-----|------|-----|------|------|------|------|-----|
|                         | 5. Trichinopo- ly.   | 1. Palamcot- tah.    | 2. Madura.            | 3. Dindigul.          | 4. Panchgaut.         | 6. Combaro- num.      | 7. Columbare.         | 8. Salem.             | 9. Arcot.             | 10. Vellore.          | 11. Rajahmum- dry.   | 12. Samalcoo- tah.   | 13. Vidiana- gpur.   | 14. Barham- pore.    | 15. Mysaloom- dah.    | Total.                |                       |     |     |     |     |     |      |     |      |     |      |     |      |      |      |      |     |
| Fever.                  | Ad. 371<br>Died. 6.5 | Ad. 129<br>Died. 1.6 | Ad. 106<br>Died. 1.86 | Ad. 190<br>Died. 1.8  | Ad. 116<br>Died. 2.3  | Ad. 233<br>Died. 3.3  | Ad. 251<br>Died. 3.4  | Ad. 81<br>Died. 2.05  | Ad. 124<br>Died. 1.   | Ad. 150<br>Died. 2.3  | Ad. 117<br>Died. 5.3 | Ad. 170<br>Died. 2.9 | Ad. 438<br>Died. 5.6 | Ad. 249<br>Died. 3.6 | Ad. 489<br>Died. 3.7  | Ad. 3721<br>Died. 3.1 | Ad. 3721<br>Died. 3.1 |     |     |     |     |     |      |     |      |     |      |     |      |      |      |      |     |
| Erysip.                 | Ad. 96<br>Died. 2.3  | Ad. 5<br>Died. 0.9   | Ad. 6<br>Died. 1.1    | Ad. 12<br>Died. 1.3   | Ad. 9<br>Died. 0.8    | Ad. 10<br>Died. 1.6   | Ad. 4<br>Died. 1.1    | Ad. 9<br>Died. 0.9    | Ad. 9<br>Died. 0.9    | Ad. 6<br>Died. 0.6    | Ad. 7<br>Died. 0.7   | Ad. 8<br>Died. 0.8   | Ad. 13<br>Died. 1.9  | Ad. 9<br>Died. 1.4   | Ad. 9<br>Died. 1.1    | Ad. 9<br>Died. 0.9    | Ad. 9<br>Died. 0.9    |     |     |     |     |     |      |     |      |     |      |     |      |      |      |      |     |
| Lung dis.               | Ad. 107<br>Died. 3.3 | Ad. 1<br>Died. 1.1   | Ad. 1<br>Died. 1.1    | Ad. 1<br>Died. 1.1    | Ad. 83<br>Died. 2.3   | Ad. 51<br>Died. 1.6   | Ad. 64<br>Died. 2.3   | Ad. 31<br>Died. 1.6   | Ad. 26<br>Died. 1.6   | Ad. 15<br>Died. 1.6   | Ad. 13<br>Died. 1.6  | Ad. 25<br>Died. 1.6  | Ad. 25<br>Died. 1.6  | Ad. 40<br>Died. 2.3  | Ad. 18<br>Died. 2.3   | Ad. 18<br>Died. 2.3   | Ad. 18<br>Died. 2.3   |     |     |     |     |     |      |     |      |     |      |     |      |      |      |      |     |
| Bowel dis.              | Ad. 183<br>Died. 2.5 | Ad. 30<br>Died. 1.5  | Ad. 10<br>Died. 1.5   | Ad. 13<br>Died. 1.3   | Ad. 2<br>Died. 0.8    | Ad. 8<br>Died. 1.6    | Ad. 10<br>Died. 2.3   | Ad. 14<br>Died. 2.3   | Ad. 11<br>Died. 4.8   | Ad. 3<br>Died. 1.8    | Ad. 10<br>Died. 4.8  | Ad. 3<br>Died. 1.8   | Ad. 11<br>Died. 4.8  | Ad. 4<br>Died. 1.8   | Ad. 15<br>Died. 4.8   | Ad. 15<br>Died. 4.8   | Ad. 15<br>Died. 4.8   |     |     |     |     |     |      |     |      |     |      |     |      |      |      |      |     |
| Cholera.                | Ad. 15<br>Died. 2.3  | Ad. 2<br>Died. 1.5   | Ad. 4<br>Died. 1.5    | Ad. 6<br>Died. 1.3    | Ad. 9<br>Died. 1.3    | Ad. 3<br>Died. 1.6    | Ad. 1<br>Died. 1.1    | Ad. 6<br>Died. 2.5    | Ad. 5<br>Died. 2.5    | Ad. 2<br>Died. 1.8    | Ad. 3<br>Died. 2.3   | Ad. 3<br>Died. 2.3   | Ad. 3<br>Died. 2.3   | Ad. 7<br>Died. 2.5   | Ad. 3<br>Died. 2.5    | Ad. 3<br>Died. 2.5    | Ad. 3<br>Died. 2.5    |     |     |     |     |     |      |     |      |     |      |     |      |      |      |      |     |
| Brain dis.              | Ad. 3<br>Died. 0.9   | Ad. 1<br>Died. 1.5   | Ad. 1<br>Died. 1.5    | Ad. 2<br>Died. 0.9    | Ad. 2<br>Died. 0.9    | Ad. 1<br>Died. 1.6    | Ad. 1<br>Died. 1.1    | Ad. 14<br>Died. 8.3   | Ad. 33<br>Died. 3.3   | Ad. 2<br>Died. 0.6    | Ad. 2<br>Died. 0.6   | Ad. 2<br>Died. 0.6   | Ad. 3<br>Died. 4.1   | Ad. 13<br>Died. 1.9  | Ad. 7<br>Died. 1.9    | Ad. 7<br>Died. 1.9    | Ad. 7<br>Died. 1.9    |     |     |     |     |     |      |     |      |     |      |     |      |      |      |      |     |
| Dropsies.               | Ad. 113<br>Died. 3.3 | Ad. 38<br>Died. 1.9  | Ad. 33<br>Died. 1.9   | Ad. 65<br>Died. 3.3   | Ad. 77<br>Died. 3.3   | Ad. 41<br>Died. 3.3   | Ad. 33<br>Died. 3.3   | Ad. 34<br>Died. 3.3   | Ad. 33<br>Died. 3.3   | Ad. 2<br>Died. 0.6    | Ad. 2<br>Died. 0.6   | Ad. 2<br>Died. 0.6   | Ad. 3<br>Died. 4.1   | Ad. 57<br>Died. 1.9  | Ad. 76<br>Died. 1.9   | Ad. 58<br>Died. 1.9   | Ad. 58<br>Died. 1.9   |     |     |     |     |     |      |     |      |     |      |     |      |      |      |      |     |
| Rheumat.                | Ad. 307<br>Died. 1.9 | Ad. 19<br>Died. 1.9  | Ad. 28<br>Died. 1.9   | Ad. 33<br>Died. 1.9   | Ad. 53<br>Died. 1.9   | Ad. 94<br>Died. 3.3   | Ad. 34<br>Died. 3.3   | Ad. 11<br>Died. 1.6   | Ad. 11<br>Died. 1.6   | Ad. 3<br>Died. 0.6    | Ad. 3<br>Died. 0.6   | Ad. 3<br>Died. 0.6   | Ad. 3<br>Died. 0.6   | Ad. 9<br>Died. 2.6   | Ad. 26<br>Died. 2.6   | Ad. 21<br>Died. 2.6   | Ad. 21<br>Died. 2.6   |     |     |     |     |     |      |     |      |     |      |     |      |      |      |      |     |
| Ven. affec.             | Ad. 74<br>Died. 1.3  | Ad. 2<br>Died. 1.3   | Ad. 17<br>Died. 1.3   | Ad. 36<br>Died. 1.3   | Ad. 57<br>Died. 2.8   | Ad. 26<br>Died. 2.8   | Ad. 31<br>Died. 2.8   | Ad. 11<br>Died. 1.6   | Ad. 11<br>Died. 1.6   | Ad. 3<br>Died. 0.6    | Ad. 3<br>Died. 0.6   | Ad. 3<br>Died. 0.6   | Ad. 3<br>Died. 0.6   | Ad. 9<br>Died. 2.6   | Ad. 14<br>Died. 2.6   | Ad. 13<br>Died. 2.6   | Ad. 13<br>Died. 2.6   |     |     |     |     |     |      |     |      |     |      |     |      |      |      |      |     |
| Eye dis.                | Ad. 18<br>Died. 4.4  | Ad. 2<br>Died. 1.3   | Ad. 14<br>Died. 1.3   | Ad. 36<br>Died. 1.3   | Ad. 123<br>Died. 2.8  | Ad. 54<br>Died. 2.8   | Ad. 72<br>Died. 2.8   | Ad. 7<br>Died. 1.6    | Ad. 7<br>Died. 1.6    | Ad. 3<br>Died. 0.6    | Ad. 3<br>Died. 0.6   | Ad. 3<br>Died. 0.6   | Ad. 3<br>Died. 0.6   | Ad. 49<br>Died. 2.6  | Ad. 36<br>Died. 2.6   | Ad. 36<br>Died. 2.6   | Ad. 36<br>Died. 2.6   |     |     |     |     |     |      |     |      |     |      |     |      |      |      |      |     |
| Skin dis.               | Ad. 141<br>Died. 1.1 | Ad. 110<br>Died. 1.1 | Ad. 135<br>Died. 1.1  | Ad. 339<br>Died. 1.1  | Ad. 279<br>Died. 1.1  | Ad. 143<br>Died. 1.1  | Ad. 132<br>Died. 1.1  | Ad. 109<br>Died. 1.1  | Ad. 398<br>Died. 1.1  | Ad. 234<br>Died. 1.1  | Ad. 23<br>Died. 1.1  | Ad. 61<br>Died. 1.1  | Ad. 80<br>Died. 1.1  | Ad. 76<br>Died. 1.1  | Ad. 111<br>Died. 1.1  | Ad. 150<br>Died. 1.1  | Ad. 150<br>Died. 1.1  |     |     |     |     |     |      |     |      |     |      |     |      |      |      |      |     |
| Aw. & ul.               | Ad. 301<br>Died. 4.4 | Ad. 44<br>Died. 1.35 | Ad. 135<br>Died. 1.35 | Ad. 339<br>Died. 1.35 | Ad. 279<br>Died. 1.35 | Ad. 143<br>Died. 1.35 | Ad. 132<br>Died. 1.35 | Ad. 109<br>Died. 1.35 | Ad. 398<br>Died. 1.35 | Ad. 234<br>Died. 1.35 | Ad. 23<br>Died. 1.35 | Ad. 61<br>Died. 1.35 | Ad. 80<br>Died. 1.35 | Ad. 76<br>Died. 1.35 | Ad. 111<br>Died. 1.35 | Ad. 150<br>Died. 1.35 | Ad. 150<br>Died. 1.35 |     |     |     |     |     |      |     |      |     |      |     |      |      |      |      |     |
| Other dis.              | Ad. 301<br>Died. 4.4 | Ad. 44<br>Died. 1.35 | Ad. 135<br>Died. 1.35 | Ad. 339<br>Died. 1.35 | Ad. 279<br>Died. 1.35 | Ad. 143<br>Died. 1.35 | Ad. 132<br>Died. 1.35 | Ad. 109<br>Died. 1.35 | Ad. 398<br>Died. 1.35 | Ad. 234<br>Died. 1.35 | Ad. 23<br>Died. 1.35 | Ad. 61<br>Died. 1.35 | Ad. 80<br>Died. 1.35 | Ad. 76<br>Died. 1.35 | Ad. 111<br>Died. 1.35 | Ad. 150<br>Died. 1.35 | Ad. 150<br>Died. 1.35 |     |     |     |     |     |      |     |      |     |      |     |      |      |      |      |     |
| Total.                  | 1814                 | 496                  | 115                   | 414                   | 13                    | 713                   | 8.4                   | 940                   | 10.8                  | 638                   | 12.6                 | 644                  | 10.2                 | 338                  | 26.2                  | 631                   | 8.7                   | 483 | 8.9 | 323 | 13. | 515 | 10.2 | 898 | 31.5 | 600 | 15.7 | 856 | 15.1 | 1696 | 12.6 | 13.5 |     |
| Exclus. of Cholera.     | { }                  | { }                  | { }                   | { }                   | { }                   | { }                   | { }                   | { }                   | { }                   | { }                   | { }                  | { }                  | { }                  | { }                  | { }                   | { }                   | { }                   | { } | { } | { } | { } | { } | { }  | { } | { }  | { } | { }  | { } | { }  | { }  | { }  | { }  | { } |

\* Included under "other diseases."

† Dysentery and diarrhoea are the only "diseases of the bowels" specified at these stations, dyspepsia and obstipation being included with "other diseases."

‡ In calculating the ratios in this column, we have omitted the strength at Arcot and Vellore in all those classes of diseases marked \* or †; the strength out of which the admissions and deaths took place having been 26979 instead of 70877.

do not show to what extent the health of the troops has been influenced by this at the different stations, but from the position of Vizianagrum and Berhampore, a considerable portion of the force for that service must have been drawn thence, and the men who became inefficient during the course of it must have been directed on them, while it is also probable they were garrisoned by some of the regiments so employed on their return from that country. Russelcondah, also, having been established for the first time at the termination of that campaign, must necessarily have been occupied by a portion of that force; and as the men had been much exposed to the causes of fever, we might naturally anticipate a considerable amount of sickness among them. This view is confirmed by the higher ratio of fever, which, on the average of all the stations, has been 218, but excluding the three mentioned, does not exceed 139 per 1000. The very high ratio of mortality at Salem, 18 per 1000, exclusive of cholera, was chiefly caused by a large number of cases of beriberi, by which 24 admissions and 17 deaths took place, most of them in 1832 and 1833. The medical officer in his report stated that "nothing satisfactory could be elicited as to the cause of this outbreak of beriberi." Taking the average of all the stations, the ratio both of admissions and deaths among the native troops has been rather lower at the stations on the plains than on the coast. As regards the admissions, there is no material difference in the more important classes of diseases; while as regards the deaths, the stations on the plains have enjoyed a comparative exemption from diseases of the bowels, and also slightly from those of the lungs, but have suffered more from cholera and dropsies.

We shall now proceed to the consideration of

### III. *The Stations on the Table Lands.*

1. *Merhara or Muddykeree*, the capital of Coorg, is situated in  $12^{\circ}.27'$  north latitude,  $75^{\circ}.18'$  east longitude, at a height of 4500 feet above the level of the sea, at the south-east angle of an oblong table land, about 18 miles in length by 13 in breadth, and which consists of a succession of low narrow ridges with fertile valleys between. On the east and north the hills have a gentle declivity, and are clothed with wood, but on the south they are precipitous and bare, descending abruptly a depth of 600 feet to the southern division of Coorg. A small river rises near Merkarah, but no lakes or marshes exist in the neighbourhood. "In the vicinity of Merkara the rocks are primitive, consisting mostly of sienite, occasionally traversed by greenstone, the whole being covered with a thick lithomargic earth, composed of felspar in various stages of decomposition, the agglutinating basis being argillaceous earth coloured by oxide of iron. . . .

... Immediately over the lithomargic earth is a stratum varying greatly in thickness, of rich vegetable mould, resulting from the decomposition of the luxuriant vegetation with which the whole country is clothed during the greater part of the year."

The fort is built on the summit of a small isolated hill, about 150 yards from the boundary ridge of the table-land on the south. The Sepoy lines are below the fort, on the south and south-west slopes of the hill, the huts being constructed of wattle and mud, with thatched roofs.

The climate is mild and equable, the annual range of temperature being from  $52^{\circ}$  to  $82^{\circ}$ . The maximum height of the barometer is 26.22 during the dry season, and the minimum 25.91 during the monsoon. The monsoon sets in about the middle of June, and continues during the three following months. The air is very moist, and during the intervals of the rains, dense fogs prevail. In October the weather is usually bright, but the N. E. wind is very cold. November is cold and showery, and in the early part of December fogs are frequent. From this period the weather is fine, the days being cool till March or April, when the heat of the sun becomes oppressive, but the nights are generally pleasant.

The following table shows the mean temperature in each month for two years at 6 A. M. and 10 A. M., and also the fall of rain in inches.

|                 | June. | July. | Aug.  | Sept. | Oct.  | Nov. | Dec. | Jan. | Feb. | Mar. | April. | May. | Mean.  |
|-----------------|-------|-------|-------|-------|-------|------|------|------|------|------|--------|------|--------|
| Temperature.    |       |       |       |       |       |      |      |      |      |      |        |      |        |
| 1835 { 6 A. M.  | 66.7  | 65.4  | 65    | 64    | 65    | 63   | 56   | 53   | 56   | 61   | 64     | 64   | 61.9   |
| 1836 { 10 A. M. | 69.9  | 67.7  | 68    | 68    | 68    | 67   | 64   | 64   | 69   | 73   | 75     | 72   | 68.    |
| 1836 { 6 A. M.  | 62    | 62    | 60    | 62    | 63    | 60   | 58   | 56   | 60   | 64   | 65     | 63   | 61.25  |
| 1837 { 10 A. M. | 68    | 64.2  | 63    | 67    | 68    | 70   | 70   | 69   | 74   | 76   | 78     | 72   | 69.91  |
| Rain.           |       |       |       |       |       |      |      |      |      |      |        |      |        |
| 1835-6—inches   | 44.77 | 20.80 | 23.25 | 13.53 | 10.24 | 2.18 | ...  | ...  | ...  | 0.02 | 1.87   | 2.48 | 119.14 |
| 1836-7—inches   | 20.84 | 23.74 | 24.74 | 7.02  | 0.55  | 1.55 | 0.07 | ...  | ...  | 1.29 | 0.21   | 7.64 | 87.65  |

The prevailing winds from April to October are W. N. W. ; and from October to February, N. E. and E. N. E. ; in March they are variable.

The detachment of European artillery at Merkara, consisting of 22 men, has been quartered in the lower storey of the Rajah's Palace within the fort ; no details are given regarding the state of their health. The aggregate of the native force employed there from 1835 to 1843 inclusive, amounted to 8902 men, of whom 5131 were admitted into hospital, and 72 died, being in the ratio of 576, and 8.1 per 1000 of mean strength annually.

2. *The French Rocks* is a station seven miles north-west of Seringapatam, and lies in  $12^{\circ} 39'$  N. lat.,  $76^{\circ} 50'$  E. long., on gently rising ground, at an elevation of 2300 feet above the level of the sea. The surrounding country is hilly, rocky, and barren, and intersected by numerous deep ravines; two ranges of hills rise at some little distance to the east and north-east of the station, the former running in a northerly, and the latter in a north-westerly direction. The soil is gravelly, with a few patches of light red loam. There are no jungles, marshes, or swamps, and but a very small extent of irrigated land in the immediate neighbourhood of the cantonment.

The climate is moist, and, during the first quarter of the year, heavy dews and fogs are frequent. The hot season extends from the middle of February to the middle of June; but the thermometer seldom rises above  $85^{\circ}$ , and the nights and mornings are cool. About the latter period the south-west monsoon sets in, and the rains continue till the middle of September. The north-east monsoon is also generally accompanied with heavy rain. In December and January the weather is cold, the thermometer seldom rising above  $72^{\circ}$  at noon, and falling as low as  $50^{\circ}$  at sunrise.

The barrack stands in the centre of the cantonment, facing the south; in its rear is the hospital, a substantial tiled building, raised two feet from the ground, and having verandahs in front and rear of eight feet in breadth. The Sepoy lines are behind the hospital, separated from the other parts of the cantonment by a road. The streets are stated to be broad and clean, and the huts comfortable and in good repair.

The native force does not exceed one battalion. The aggregate strength for nine years, 1833–41, was 7891, among whom the admissions into hospital have amounted to 5322, and the deaths to 141, being in the ratio of 674 and 17.9 per 1000.

Seringapatam was formerly the capital of Mysore, and the head-quarters of the troops; but was abandoned on account of the fatal endemic fever which prevailed among both Europeans and natives.

3. *Bangalore*, the head quarters of the Mysore division of the army, is situated in  $12^{\circ} 57'$  N. lat.,  $77^{\circ} 38'$  E. long., on one of the highest ridges of table land in that country, at a height of 3000 feet above the level of the sea, and nearly midway between the Malabar and Coromandel coasts. The country surrounding the cantonment is generally barren, and the ground undulating and intersected with deep ravines. The soil throughout the district of Bangalore is dry and gravelly, but tolerably productive. The hills are chiefly composed of granite, gneiss, and



hornblende; the nearest jungle is about fifteen miles distant from the station in a south-westerly direction.

The climate is generally cool and pleasant. The south-west monsoon commences about June and continues till the beginning of September, constituting the wet season. The temperature ranges from 64°, the minimum, in January, to 89°, the maximum, in May; the extreme daily range varies from 8° to 12°. On the average of five years ending 1835, the mean temperature within doors was 75°, in the open air 83°. The quantity of rain which fell in 1835 was 44 inches.

The ridge on which the cantonment stands runs east and west, and slopes to the north and south. At the east end lies the village of Ulsoor, in a low position, from which the ground rises gradually. On the highest portion of the ridge, to the extreme right, are the barracks of the horse artillery, and a little lower those of the foot artillery. Next are those of the European cavalry and infantry, then of the native infantry, while the native cavalry lines are thrown back to the northward, near the Ulsoor Tank. The European cavalry barracks consist of eight ranges of brick buildings, one for each troop, surrounded by a wall nine feet in height; the ground slopes gently, thereby preventing the accumulation of water near them. The horse lines are placed between the barracks and the Ulsoor tank. The European infantry barracks are inferior to the cavalry; they are built in the form of a square, and in consequence of having no verandah, the rooms are hot during the day. The hospital is in rear of the barracks, built of brick, with floors raised three feet from the ground. Immediately behind the infantry barracks is the public bazaar, near the western end of which the Sepoys are huddled. The force at Bangalore usually consists of one regiment of European and one of native cavalry, one troop of European and one of native horse artillery, one company of European foot artillery, one regiment of European and two to four of native infantry.

During ten years, 1829–38, the aggregate strength of European soldiers amounted to 15,590, among whom 25,425 admissions and 437 deaths took place; the former being 1631 and the latter 28 per 1000 of the mean strength annually. The proportion of admissions has varied between 1280 in 1832 and 2369 in 1833, and the deaths between 19·1 in 1832 and 34·7 in 1829.

The admissions and deaths among the native troops have not been stated separately for Bangalore, but have been included with the other stations in the Mysore division. The total strength in that country, during ten years, 1829–38, amounted to 70,016, the admissions to 46,976, and the deaths

to 991, giving the relative proportions of 671 and 14·1 per 1000 annually.

4. *Hurryhur* is situated in 14° 29' N. lat., 75° 52' E. long., on an extensive plain about a mile from the right bank of the Toombuddra river, at an elevation of 1830 feet above the level of the sea, from which it is 90 miles distant. The surrounding country is clear and open to a distance of from 8 to 16 miles, and there are no marshy lands in the vicinity. The cantonment stands on a sandy or gravelly soil; that of the neighbouring country is either black cotton earth or a red sand irregularly distributed.

Except in May and June, previous to the setting in of the south-west monsoon, the climate is pleasantly cool. The greatest fall of rain takes place during the north-east monsoon, and strong winds prevail during both.

The Sepoy lines run east and west, and present a gradual descent towards the river. The hospital is a commodious building in rear of the lines, raised about 18 inches above the ground. The aggregate strength of the native troops during ten years, 1832-41, has been 8500 men, of whom 5020 have been admitted into hospital, and 103 have died, being in the ratio of 591 admissions and 12·1 deaths per 1000 annually.

5. *Cuddapah* is situated in 14° 32' N. lat., 78° 54' E. long., on the table land between the Eastern and Western Ghauts, at an elevation of 507 feet above the level of the sea. The cantonment, which is separated from the town by a small river, stands on a gentle declivity, from three to six miles from the hills on the north-east and south, and having an extensive open plain on the west, stretching to the foot of the hills at a distance of thirty miles. Cuddapah is intersected by two nullahs; the one immediately in front of the regimental lines, the other and larger one on the west side of the town; the streams unite and fall into the Pennar, four miles north of the station. The soil in the valley of Cuddapah is light and sandy, consisting of the debris of the neighbouring hills, but in the plains to the west and north it is a rich black cotton ground. The hills and likewise the banks of the streams are covered with a low dense jungle and long rank grass, and there are numerous tanks throughout the district. From its vicinity to the hills, which rise to a height of 1000 to 1500 feet, the heat at Cuddapah is very great, attended with closeness and stagnation of the air at night; the mean annual temperature being 81½°, the maximum 98°, and the minimum 65°. The south-west monsoon sets in early in June, and lasts till September, attended with oppressive calms at night and partial rains. In the end of October the north-east mon-

soon begins with heavy rains, which continue till the end of November; the weather is then cool and pleasant till February or March, after which the hot season commences and lasts till the setting in of the S. W. monsoon. The heat is intensely felt, owing to the radiation from the surrounding hills.

The barracks are two substantial brick buildings, parallel to each other, which stand on a gentle slope, the soil being sandy. The hospital is to the left of these, on low ground where water lodges during heavy rains, and the floor is not sufficiently raised. The Sepoy lines are situated in rear of the barracks, and between them and the river. The strength of the native troops during nine and a-half years, 1829-41, amounted to 8483, the admissions into hospital, to 5930, and the deaths to 123; being in the ratio of 699 and 14.5 per 1000. Of the deaths, however, 62 occurred from cholera, which being deducted would reduce the ratio of mortality at this station to 7.2 per 1000.

6. *Bellary* is situated in 15° 5' N. lat., 76° 59' E. long., at an elevation of 1182 feet above the level of the sea, and at a distance of about 180 miles from the Ghauts on either side. The plain around the station is flat, free from jungle, and but little cultivated, bounded to the west at a distance of six miles by a low range of barren hills. There are no rivers or marshy grounds near the cantonment. The soil is red and gravelly to the distance of a mile, but the prevailing soil throughout the plain is black cotton ground. The climate is characterized by extreme dryness; the quantity of rain in 1841 amounted only to 26 $\frac{1}{8}$  inches, and in 1842 to 17 $\frac{5}{16}$ . The prevailing winds are from the west and north-west from March to November, and from the east and south-east in December, January, and February. In the cold season the temperature occasionally falls below 50° at sunrise. The hottest months are March, April, and May, during which the average temperature at noon ranges between 92° and 99°, the nights and mornings are, however, comparatively cool.

The fort of Bellary covers a bare granite hill of an oblong form, stretching north and south, about two miles in circumference, and 450 feet in height, and presenting a bold and precipitous aspect on its eastern and southern sides, but on its western sloping gradually towards the plain. A few hundred yards to the north is a ridge of similar bare rugged rocks, and at a short distance to the east are several smaller ridges of the same character. They are all of granitic formation, and chiefly composed of felspar and ferruginous hornblende. There are two lines of works on the rock, constituting the upper and the lower forts. In the upper are the cells for prisoners, in the lower the bar-

racks for H. M. regiment and the European artillery, the arsenal, stores, &c. About 100 yards from the fort on the south side is a large tank, which when full is upwards of three miles in circumference; but during the dry season is reduced to half that size, and the ground thus exposed is said to give rise to noxious exhalations. There are two European barracks within the fort; one on high ground close to the ramparts on the south side, and overlooking the tank; the other on lower ground on the north side. They are built in the form of a square, have verandahs round them, and tiled roofs. About 100 yards from the first of these, upon high ground close to the base of the rock, stands the artillery barrack, forming three sides of a square. The European hospital is situated about a mile to the west of the fort, in an open dry plain, and can accommodate 130 patients. The barracks for the native troops are about a mile and a half to the south-west of the fort, built of stone, with tiled roofs, and having a southern exposure. They afford accommodation for three infantry and one cavalry regiments. The hospitals consist of three buildings adjoining the barracks. The Sepoy lines are situated at a short distance from the rock on its western side.

During ten years, 1829-38, the strength of the European troops at this station amounted to 9020, the admissions into hospital to 17,992, and the deaths to 285; being in the proportion of 1995 of the former and 31.6 per 1000 of the latter. The returns of the native troops at Bellary have not been given separate from the other stations in the Ceded districts. Including the force at Cuddapah, already described, and two companies at Ghooty, formerly a place of importance, but now falling into decay, the aggregate strength has amounted in ten years, 1829-38, to 35,999; among whom 17,804 admissions and 581 deaths have occurred; being in the ratio of 495 and 16.1 respectively.

7. *Kurnool* is situated in  $15^{\circ} 50'$  N. lat.,  $78^{\circ} 6'$  E. long., at a height of 900 feet above the level of the sea, on an angle of land formed by the junction of the rivers Henderry and Toombuddra. The fort and town lie in a hollow, the ground to the west and north rising gently for a mile and a half, while about five miles to the eastward there is a low range of hills, and on the south a wedge-shaped hill about four miles distant. The hills near the station are sandstone; and the soil in the neighbourhood chiefly black cotton ground upon limestone. The prevailing winds are west and north-east. The mean annual temperature is about  $80^{\circ}$  degrees. During April, May, and June, which are the hottest months, the thermometer ranges from  $86^{\circ}$  to  $98^{\circ}$ , and in the cool season from  $64^{\circ}$  to  $78^{\circ}$ .

The fort stands on the south bank of the Toombuddra; its

walls are seventeen feet high, built of limestone and sandstone. The river flows past the northern and eastern faces, and a deep broad dry ditch runs from west to south. The regimental lines extend over a plain 300 yards from the west gate of the fort, and separated from the Toombuddra by the village of Nova Pettah. The barracks are within the fort near the west gate. The hospital stands near the east gate, and is a well-ventilated building, calculated to accommodate 30 patients.

The station of Kurnool has been occupied since 1839, when the principality was taken possession of by the British, in consequence of the treasonable designs of the Nabob. In three years, 1840-42, the strength has amounted to 3810, out of which 2040 admissions and 37 deaths have taken place, being in the proportion of 535 and 9·7 per 1000 annually.

8. *Secunderabad*, the head-quarters of the Hyderabad subsidiary force, stands 6 miles north of the city of Hyderabad, in 17° 26' N. lat., 78° 32' E. long., at an elevation of 1837 feet above the level of the sea. The surrounding country is wild and picturesque, being interspersed with small hillocks of granite. At a distance of three miles to the west is a range of hills consisting of granite rocks heaped one on the other, and to the north-east are two very remarkable large granite hills of hemispherical shape, about three miles asunder, and perfectly isolated. The soil on the higher grounds is chiefly silicious. The whole country is studded with tanks, which are used for irrigation.

The south-west monsoon sets in about the beginning of June, and lasts till the middle of October. The annual fall of rain at Secunderabad is estimated at 32 inches, but in years when the monsoon fails it does not amount to half that quantity. The daily range of the thermometer from November to February is very considerable, amounting to from 20° to 30° in the shade.

The cantonment extends nearly three miles in length. At the east end are the European infantry barracks, built on the side of a hill sloping gently to the eastward. They are surrounded by high land, except towards the south-west, where there is a low swampy plain interspersed with tanks, stagnant pools, and rice fields, and having a date plantation extending to within 500 yards of the barrack wall; at a distance of about 100 yards to the north-west is the crowded burying-ground for the Queen's troops. The soil on which the barracks stand is a reddish clay mixed with decomposed granite. The hospital is situated on higher ground 400 yards to the west of the barracks, and is a brick building with tile roof, and surrounded by enclosed verandahs. A little farther west are the lines of the officers of the regiment. West of the European lines are those of the four native regiments, with the hospitals and barracks in front. The horse ar-

tillery lines lie to the north-west, while the foot artillery are north of those of the infantry, on higher ground, and about a mile distant. They are separated from the horse artillery by a narrow strip of low rice ground. From one to two miles north is a small range of hills about 150 feet in height. At the south-western end of the cantonment is an extensive sheet of water called the "Hussain Saugor" tank, to the eastward of which is a tract of cultivated rice ground about eight miles in length.

The cavalry lines are at Bowenpilly, two miles north of the cantonment, in an open country and on dry elevated ground.

The European troops at Secunderabad, (including a troop of horse artillery at Jaulnah,) have, during ten years, 1829-38, amounted to an aggregate strength of 10,557, among whom the admissions into hospital have been 22,933 and the deaths 664, being in the proportion of 2172 and 62.9 per 1000 annually. The strength of the native force at Secunderabad and Jaulnah for the same period has been 81,042 men, of whom 46,478 have been admitted, and 1207 have died, being in the ratio of 573, and 14.9 per 1000 respectively.

9. *Jaulnah* is situated in 19° 50' N. lat., 76° E. long., in the province of Aurungabad, 1650 feet above the level of the sea, on the left bank of the River Koondulka, which in the dry season is a very small stream, but during the monsoon comes down with great violence. The surrounding country is hilly, intersected with numerous ravines and extensive tracts of waste stony land, covered with long grass. The soil in the vicinity of the station is chiefly cotton ground with patches of red gravel.

The hot season lasts from March to June, during which the temperature in the middle of the day ranges from 90° to 100°, but it is comparatively cool in the mornings. The monsoon extends from July to October, with a partial cessation of the rains in September; the average annual fall of rain is 32 inches. From November to February comprises the cold season, when the thermometer ranges between 40° and 80°. The prevailing winds are from the west in the hot season; from the north and east during the cold season.

The cantonment stands on a gently-sloping declivity, and is capable of affording accommodation for one troop of European horse artillery, one regiment of native cavalry, and three of native infantry; two of the lines for native regiments are, however, unoccupied. The cavalry lines are at the south-east end of the cantonment, the barracks facing to the north. The officers' houses are in rear of the barracks, and the Sepoys' huts 200 yards behind them. The hospital is at the extreme end of the barracks, well elevated, and capable of accommodating 80 or

100 patients. The infantry lines are in the centre of the cantonment. The Sepoys' huts are in rear of the hospital, and are laid out in regular streets, admitting of a free circulation of air through them. The European artillery barracks are at the north-west end, and occupy the highest ground in the cantonment, the country in front being open for several miles. A branch of the Koondulka runs close to the left. The whole of the site is well drained, the ground having a natural slope towards the river.

The returns do not state the sickness and mortality among the troops at Jaulnah separately from those at Secunderabad, and we have consequently been compelled to include them together. The following statement, however, of the admissions and deaths among the European horse artillery during 11 years, (1829 to 1841, exclusive of 1831 and 1835,) shows the mortality to have been much lower than that of the troops at these two stations combined. The aggregate strength for that period amounted to 1219, the admissions to 3443, and the deaths to 39, being in the ratio of 2824 and 32· per 1000 annually.

10. *Kamptee*, the station occupied by the subsidiary force in the Rajah of Nagpore's country, is situated in 21° 15' N. lat., 79° 14' E. long., on the right bank of the River Kunnan, and ten miles east of Nagpore the capital, at an elevation of 900 feet above the level of the sea. The surrounding country is flat, destitute of wood, and much intersected by ravines. The soil is chiefly black cotton ground, except the site of the cantonment, which is clay. The cold season commences about the end of October and continues till the middle of March; the thermometer at sunrise has been observed at this season to be as low as 36°. From the middle of March till about 10th June constitutes the hot season; the rains then set in, and continue with occasional intervals of a few days till the return of the cold season. The greatest amount falls in August and September, the annual average being 40 inches. The prevailing winds during the cold season are N. and N. E., and during the hot, W. and S. W. In April the west wind blows for several hours during the day with considerable force, and is denominated the hot land wind.

The subsidiary force consists of one regiment of native cavalry, one troop European horse artillery, one battalion of foot artillery, one regiment of European, and four regiments of native infantry. The cavalry barrack and lines are at the east end of the cantonment; those of the native infantry are in the centre, while those of the Europeans are at the west end. The last are lofty, commodious, and situated on high ground. Adjacent are the barracks of the horse artillery, and in the same line further west

those of the foot artillery, and a small well ventilated hospital and barracks for the troop of native horse artillery. The buildings are all described as well constructed, comfortable, and healthy.

During ten years, 1829–38, the European force amounted to 9574 men, among whom 23,092 admissions and 377 deaths occurred, being in the annual ratio of 2412 and 39·4 per 1000. During the same period the strength of the native force was 49,313, of whom 30,765 were admitted into hospital, and 619 died, giving a proportion of 624 of the former, and 12·5 of the latter per 1000 of the strength.

Having now briefly described the stations on the table lands, we shall submit the usual table (TABLE III.) showing the classes of diseases by which the sickness and mortality at these have been occasioned.

This table shows the sickness among the European troops to have ranged between 1673 at Bangalore, and 2438 at Kamptee, and the mortality between 22·7 at Bangalore, and 82·1 at Secunderabad and Jaulnah, the average of all the stations on the table lands being 2082 admissions and 41 deaths per 1000 of mean strength. The mortality at Secunderabad, however, has been more than double that of any of the other stations; omitting it from the calculation the average amounts only to 29·2, being very little higher than at the Mauritius or the Bermudaa. The excess at Secunderabad has been caused chiefly by dysentery, which, during the period under review, gave rise to a higher ratio of mortality than that from all causes at the other stations on the table lands. It has been a source of great sickness and mortality among the Europeans ever since Secunderabad was first occupied in 1804, and committees have at different times been appointed to investigate into the causes of it, but without any satisfactory result. The unhealthy character of the station has been attributed by some medical officers to “an endemial malarious condition of the atmosphere, occurring at a season when the vicissitudes of climate and the diurnal ranges of temperature are very great.” It is worthy of remark, however, that the great excess of dysentery has occurred among Her Majesty’s regiments, while the European artillery have been comparatively exempt from it. Thus, out of an aggregate strength of 7561 of the former, during ten years, (1829–39, exclusive of 1833,) 2100 cases of this disease were admitted and 306 died, being in the ratio of 278 and 40·5 respectively; while among the Honourable Company’s artillery, out of a strength of 1382, only 262 admissions and 21 deaths took place, or 190 of the former and 15·2 of the latter per 1000 of mean strength. Other observers at-



**TABLE III.—Showing the principal Classes of Diseases among the Troops at the Stations on the Table Lands.**

[illegible]

• Exclusive of 3½ years, but the reports do not state which.

† The two former being included in the Mysore division, and the latter with Bellary. The figures prefixed to the names of the stations refer to their arrangement in the text.

TABLE III. continued.—Ratio per 1000 of Mean Strength.

| EUROPEAN TROOPS.      |       |             |      |                                    |      |               |      |        |      | NATIVE TROOPS. |      |                  |     |                          |      |              |     |              |     |                                |      |             |     |                                    |      |               |      |                                            |      |      |
|-----------------------|-------|-------------|------|------------------------------------|------|---------------|------|--------|------|----------------|------|------------------|-----|--------------------------|------|--------------|-----|--------------|-----|--------------------------------|------|-------------|-----|------------------------------------|------|---------------|------|--------------------------------------------|------|------|
| 3. Bangalore.         |       | 6. Bellary. |      | 8 and 9. Secunderabad and Jaulnah. |      | 10. Kaimpsee. |      | Total. |      | 1. Merkara.    |      | 2. French Rocks. |     | Mysoore Division, p. 68. |      | 4. Hurrybur. |     | 5. Cuddapah. |     | 6 and 5. Bellary and Cuddapah. |      | 7. Kurnool. |     | 8 and 9. Secunderabad and Jaulnah. |      | 10. Kaimpsee. |      | Total omitting French Rocks and Cuddapah.* |      |      |
| Ad.                   | Died. | Ad.         | D.   | Ad.                                | D.   | Ad.           | D.   | Ad.    | D.   | Ad.            | D.   | Ad.              | D.  | Ad.                      | D.   | Ad.          | D.  | Ad.          | D.  | Ad.                            | D.   | Ad.         | D.  | Ad.                                | D.   | Ad.           | D.   | Ad.                                        | D.   |      |
| 185                   | 54    | 559         | 5.9  | 774                                | 8.2  | 770           | 9.6  | 514    | 6.1  | 183            | 5.1  | 304              | 3.1 | 321                      | 4.6  | 314          | 4.6 | 348          | 5.4 | 314                            | 4.4  | 189         | 5   | 488                                | 5.7  | 436           | 5.4  | 389                                        | 4.7  |      |
| 3                     | 1     | 89          | 2.8  | 66                                 | 1.9  | 61            | 1.4  | 1      | 1.9  | 6              | 1.1  | 15               | 1.1 | 15                       | 1.1  | 6            | 1.6 | 8            | 1.5 | 5                              | 1.4  | 15          | 1.6 | 7                                  | 1.7  | 11            | 1.1  | 10                                         | 1.1  |      |
| 68                    | 1.6   | 111         | 4.6  | 103                                | 13.7 | 120           | 3.5  | 69     | 1.4  | 11             | 1.2  | 12               | 1.1 | 17                       | 1.1  | 29           | 1.1 | 8            | 1.5 | 6                              | 1.6  | 4           | 1.3 | 1                                  | 1.1  | 10            | 1.1  | 10                                         | 1.1  |      |
| 84                    | 4.5   | 205         | 9.3  | 473                                | 40.7 | 285           | 9.5  | 121    | 6.1  | 57             | 1.5  | 34               | 3.3 | 57                       | 3.6  | 35           | 3.6 | 38           | 5.5 | 22                             | 7.8  | 48          | 1.3 | 41                                 | 3.3  | 45            | 2.3  | 45                                         | 2.3  |      |
| 206                   | 8.4   | 473         | 40.7 | 285                                | 9.5  | 120           | 3.5  | 69     | 1.4  | 11             | 1.2  | 12               | 1.1 | 17                       | 1.1  | 29           | 1.1 | 8            | 1.5 | 6                              | 1.6  | 4           | 1.3 | 1                                  | 1.1  | 10            | 1.1  | 10                                         | 1.1  |      |
| 10                    | 26    | 14          | 4.3  | 13                                 | 1.6  | 8             | 1.3  | 11     | 1.8  | 1              | 1.5  | 2                | 1.1 | 3                        | 1.1  | 7            | 1.1 | 4            | 7.3 | 17                             | 7.3  | 10          | 1.3 | 11                                 | 4.7  | 9             | 1.9  | 9                                          | 1.9  |      |
| 4                     | 26    | 6           | 3.3  | 6                                  | 3.1  | 5             | 1.9  | 5      | 1.7  | 7              | 1.7  | 5                | 1.1 | 5                        | 1.1  | 11           | 1.1 | 5            | 7.3 | 3                              | 7.3  | 3           | 1.1 | 3                                  | 4.7  | 4             | 1.9  | 4                                          | 1.9  |      |
| 88                    | 173   | 173         | 173  | 84                                 | 9.1  | 183           | 18.3 | 156    | 17.7 | 45             | 1.7  | 65               | 1.1 | 55                       | 1.7  | 51           | 1.1 | 55           | 7.7 | 37                             | 13.4 | 68          | 1.1 | 46                                 | 1.7  | 58            | 1.9  | 58                                         | 1.9  |      |
| 309                   | 37    | 319         | 31.9 | 244                                | 34   | 220           | 8.9  | 329    | 34   | 18             | 1.4  | 113              | 1.3 | 81                       | 1.3  | 36           | 1.3 | 48           | 1.4 | 94                             | 1.9  | 44          | 1.1 | 16                                 | 1.3  | 19            | 1.3  | 18                                         | 1.3  |      |
| 37                    | 4.1   | 37          | 3.7  | 34                                 | 3.1  | 22            | 7    | 54     | 8.1  | 12             | 1.4  | 26               | 1.3 | 12                       | 1.3  | 30           | 1.3 | 12           | 1.4 | 24                             | 1.9  | 13          | 1.1 | 8                                  | 5.6  | 13            | 5.6  | 13                                         | 5.6  |      |
| 15                    | 1.5   | 194         | 19.4 | 10                                 | 1.0  | 84            | 3.1  | 114    | 11.4 | 68             | 1.1  | 94               | 1.3 | 68                       | 1.3  | 62           | 1.1 | 91           | 1.4 | 33                             | 1.9  | 19          | 1.1 | 26                                 | 1.3  | 30            | 1.3  | 30                                         | 1.3  |      |
| 461                   | 46.1  | 373         | 37.3 | 355                                | 35.5 | 636           | 63.6 | 459    | 45.9 | 107            | 10.7 | 68               | 6.8 | 110                      | 11.0 | 74           | 7.4 | 64           | 7.3 | 80                             | 7.0  | 88          | 8.8 | 89                                 | 8.9  | 91            | 9.1  | 91                                         | 9.1  |      |
| Total.                | 1673  | 281.7       | 2143 | 34.3                               | 2534 | 25.1          | 2438 | 37.1   | 3003 | 41.            | 576  | 8.1              | 574 | 17.9                     | 785  | 13.4         | 581 | 19.1         | 689 | 14.5                           | 646  | 16.3        | 535 | 9.7                                | 739  | 17.8          | 710  | 14.2                                       | 710  | 14.2 |
| Exclusive of cholera. |       |             | 30.1 |                                    | 80.5 |               | 38.3 |        | 38.3 |                | 7.5  |                  | 9.5 |                          | 11.6 |              | 9.2 |              | 7.2 |                                | 9.3  |             | 4.7 |                                    | 13.1 |               | 11.9 |                                            | 11.4 |      |

\* French Rocks and Hurryhur being already included in the Mysoore division, and Cuddapah with Bellary. The figures prefixed to the names of the stations refer to their arrangement in the text.

tributed the sickly condition of the troops to the situation and faulty construction of the barracks. Considerable alterations were, in consequence, made in them, and the drainage was improved, apparently at first with some benefit ; but in 1843, Her Majesty's 4th regiment suffered to as great an extent as any that had preceded it. The position of the barracks, nearly surrounded by high land which intercepts the free current of air, and on the border of a low swampy plain interspersed with tanks, stagnant pools, and rice fields, all fertile sources of malaria, seems the most probable cause of the unhealthy state of the troops. This opinion is much strengthened by the fact, that the cavalry quartered at Bowenpilly, two miles north of the cantonment are stated to have been generally very healthy; but we have no specific returns on the subject.

The troops at Kamptee have suffered considerably from fever, which prevailed to a great extent in 1834. There is nothing in the position of the cantonment to which this can be attributed. The source to which it is generally referred is the dense and extensive tracts of jungle by which the station is surrounded, although at a distance of upwards of 10 miles.

The results of the stations on the table lands generally are satisfactory, as showing that posts may be selected where European troops shall be exposed to a rate of mortality in a tropical climate not greatly exceeding that to which they are subject at home. Even Kamptee, although less favourable than the others, illustrates the advantage of a judicious selection of a site. When the subsidiary force was first sent into this country, they were quartered close to the capital; but the situation proving very unhealthy, they were moved to Kamptee, and have suffered less from sickness than at their first station.

The native troops have suffered to a greater extent at Secunderabad than at any of the other stations, and, as with the Europeans, Kamptee has stood the next in point of mortality. They have enjoyed the same marked exemption from hepatic inflammation, which has been already shown to exist on the coast and plains, and which, with dysentery, forms the most striking point of contrast with the Europeans. The immunity from pulmonary disease, which is one of the most remarkable features in the sanitary condition of the troops in India, exists even in a more marked degree than at the stations we have already examined. The general results show the same favourable condition of the health of the native army, the mortality from all causes amounting only to 14·2, or within a fraction the same as among troops in the united kingdom, and, exclusive of cholera, only to 11·4 per 1000 of mean strength.

There still remain to be described those stations which, for reasons already stated, we have classed under the head of

#### IV. *Peculiar Stations.*

1. *Cuddalore*, the depot for European pensioners, is situated on the sea coast, close to the Fort of St David, in  $11^{\circ} 45'$  north latitude,  $79^{\circ} 50'$  east longitude, about a mile from the embouchure of the Panaur. This river runs parallel to the beach for a distance of three or four miles, separated from the sea by a sand bank, in some places only a few hundred yards in breadth; it flows through Cuddalore, separating the old from the new town. The new town stands on a semicircular tract of land lying between the Panaur and a branch given off by it a few miles higher up, and which here rejoins it. The tide flows several miles up the river, which in the hot season has rather the character of an inlet of the sea than of a river, and at low water a muddy bank of considerable extent is exposed. Cuddalore stands on a sandy soil mixed with clay; the surrounding country is open, level, and free from jungle. There are numerous tanks in the neighbourhood, and irrigation is carried to a considerable extent. The pensioners, amounting usually to about 250, live in the old town, with their families, in neatly built houses laid out in streets and having each a garden attached. They perform no military duty, but are under the control of an officer in charge of the depot. The admissions into hospital during nine years, (1829—38, exclusive of 1832,) amounted to 1369, and the deaths to 135, out of an aggregate strength of 2269, being in the ratio of 603 and 59.5 per 1000 annually. This very low ratio of admissions for Europeans in India doubtless arises from the circumstance of their having no duty to perform, and, in consequence, not being compelled to come into hospital unless they are seriously ill. The mortality is nearly double the average of the stations on the coast. On examining the table of admissions and deaths on page 82, it will be observed that while there is a slight diminution of the mortality from fevers and inflammation of the liver, there is an increase in all the other classes, but especially in those of the lungs, the brain, dropsies, and "other diseases." The information regarding the pensioners is not sufficiently detailed to enable us to enter at length upon the subject; but these facts are interesting, as illustrative of the influence of age and long residence in India in modifying the character of the fatal diseases among soldiers.

2. *Vizagapatam*.—This station has already been described among the "stations on the sea coast;" it remains for us, therefore, only to notice the amount of sickness and mortality among the European veterans. Out of an aggregate strength of 2937

men during a period of thirteen years (1829-41,) there occurred 2728 admissions and 197 deaths, being in the ratio of 929 and 67·1 per 1000 of mean strength annually. This is higher than what occurs among the European pensioners at Cuddalore; but as no information is given in the reports relative to the duties of the veterans, we are unable to say how far these may have exerted an influence upon the results. On reference to the table on page 82, the chief difference in the classes of fatal diseases will be found to consist in the greater mortality at Vizagapatam, from diseases of the bowels, cholera, and diseases of the brain, while there is a slight comparative exemption from those of the lungs and from hepatitis. This table also shows the very fatal influence of dropsies on the old soldiers, the ratio of deaths from them amounting to 7·2 per 1000 annually. As they have been included with "other diseases" at Cuddalore, we cannot ascertain whether they exert a similar influence upon the pensioners there. The great mortality from diseases of the brain is attributed by the medical officers to the amount of intemperance, which at this station is stated to be excessive.

3. *Wallajahbad* is situated in 12° 48' N. lat., 79° 39' E. long., about 30 miles inland, on ground rising a little above the surrounding plain, and about 500 yards from the north bank of the Palar. The village lies to the south-east of the cantonment, at a distance of about half a mile, and is well drained and tolerably clean and airy.

The soil in the neighbourhood is sandy mixed with a marly clay, with granite rocks interspersed; and the country is partially covered by a thin stunted jungle. There is a large tank on the north of the cantonment, which is used for the irrigation of some rice fields; with the exception of these, however, there is little vegetation around the station. Between Wallajahbad and the coast are several small bare hills of granite, none of which rise to a height of above 500 feet. The climate very much resembles that of Madras, but the temperature is a little higher, and the influence of the sea breeze is by no means so strongly felt. The bed of the river is sandy, and for eight months of the year nearly dry.

The barracks are built of brick and mud in the form of a square. The site is low; the floors of the building are not raised, and the ventilation is very defective.

Wallajahbad was formerly the station of one European and one or two native regiments, but the Europeans were withdrawn on account of its extremely unhealthy character. It is now occupied by a native veteran battalion and by the Drumboy establishment. In six years 1833-8, the admissions among the veterans amounted to 1498 and the deaths to 105 out of an

aggregate strength of 5455, being in the ratio of 275 and 19.3 per 1000 of mean strength annually. The classes of diseases by which this mortality was occasioned are shown in the table on page 82. The increase above the usual proportion at stations on the plains will be found chiefly in the diseases of the lungs, bowels, and brain, and in those classed under the head of "other diseases."

The information relative to the Drumboy establishment is very defective. The boys are all Indo-Britons; their average numbers has been 114 during the 6 years 1833-8; the admissions into hospital have amounted to 1411, and the deaths to 10; being in the annual ratio of 2057 and 14.6 per 100 of mean strength. Cholera has been the most fatal disease, having given rise to a mortality of 5.9 per 1000 annually. Deducting this from the total, the ratio amounts only to 8.7 per 1000, a result which tends to corroborate the conclusions obtained in other countries as to the immunity from fatal disease enjoyed about the period of puberty.

4. *Poonamallee*, the depot of H. M. troops in this Presidency, is situated 13 miles due west of Fort St George. The country around is flat, sandy, and free from marshes. The barracks stand at the west-end of the cantonment, and are capable of accommodating 500 men. They form an oblong square, are well ventilated, and are provided with verandahs. The old fort lies 400 yards to the east of the barracks, and contains cells for solitary confinement, the magazine, stores for clothing and arms, and the hospital. The native village lies about 600 yards south-east of the fort, and is tolerably airy and clean; the detachment of Sepoys, usually 200 strong, reside with their wives and families in it. The European troops at this station consist of recruits from England, and of invalids proceeding home, and vary in number from 100 to 500 men. The recruits generally arrive about September and October, and remain till after the N. E. monsoon; the invalids come down from the interior about the end of the year. During 10 years, 1829-38, the admissions have been 4425, and the deaths 103, out of an aggregate strength of 1833; being in the ratio of 2414 and 56.2 per 1000 annually. In the following table (TABLE IV.) are shown the classes of diseases by which this sickness and mortality have been occasioned; but from the nature of the force, and the impossibility of separating the diseases of the recruits from those of the invalids, we fear no accurate deductions can be drawn as to the influence of the climate of this station upon their health.

TABLE IV.—Showing the principal Classes of Diseases among the Veterans and Pensioners, and at the Drumboy Establishment, and the Depot at Poonamallee.

| STATIONS.             |  |  |  |                    |  |  |  |                  |  |  |  | Ratio per 1000 of mean strength. |  |  |  |               |  |  |  |                 |  |  |  |                 |  |  |  |                 |  |  |  |      |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  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|     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  | 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| 1. Cuddalore.         |  |  |  | 2. Vizagapatam.    |  |  |  | 3. Wallajahbad.  |  |  |  | 4. Poonamallee.                  |  |  |  | 1. Cuddalore. |  |  |  | 2. Vizagapatam. |  |  |  | 3. Wallajahbad. |  |  |  | 4. Poonamallee. |  |  |  |      |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |  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| European Pensioners.  |  |  |  | European Veterans. |  |  |  | Native Veterans. |  |  |  | Drumboy Establishment.           |  |  |  | Depot.        |  |  |  | Ad.             |  |  |  | D.              |  |  |  | Ad.             |  |  |  | D.   |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  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| 1829-38. <sup>1</sup> |  |  |  | 1829-41.           |  |  |  | 1833-8.          |  |  |  | 1833-8.                          |  |  |  | 1829-38.      |  |  |  | 1833-38.        |  |  |  | Ad.             |  |  |  | D.              |  |  |  | Ad.  |  |  |  | D.  |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  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 |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  | 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| 2289                  |  |  |  | 2837               |  |  |  | 5455             |  |  |  | 686                              |  |  |  | 1833          |  |  |  | 1833            |  |  |  | Ad.             |  |  |  | D.              |  |  |  | Ad.  |  |  |  | D.  |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  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| 78                    |  |  |  | 5                  |  |  |  | 154              |  |  |  | 7                                |  |  |  | 522           |  |  |  | 19              |  |  |  | 201             |  |  |  | 2               |  |  |  | 584  |  |  |  | 8   |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  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 |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     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| 93                    |  |  |  | 20                 |  |  |  | 116              |  |  |  | 17                               |  |  |  | 43            |  |  |  | 11              |  |  |  | 30              |  |  |  | ...             |  |  |  | 394  |  |  |  | 29  |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  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 |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     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| 138                   |  |  |  | 9                  |  |  |  | 115              |  |  |  | 6                                |  |  |  | 2             |  |  |  | 1               |  |  |  | 4               |  |  |  | ...             |  |  |  | 438  |  |  |  | 11  |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  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| +212                  |  |  |  | 34                 |  |  |  | 768              |  |  |  | 64                               |  |  |  | +103          |  |  |  | 13              |  |  |  | +112            |  |  |  | 2               |  |  |  | +535 |  |  |  | 23  |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  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| 10                    |  |  |  | 6                  |  |  |  | 28               |  |  |  | 15                               |  |  |  | 31            |  |  |  | 17              |  |  |  | 4               |  |  |  | ...             |  |  |  | 8    |  |  |  | 5   |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  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| 34                    |  |  |  | 11                 |  |  |  | 126              |  |  |  | 29                               |  |  |  | ...           |  |  |  | ...             |  |  |  | ...             |  |  |  | ...             |  |  |  | 15   |  |  |  | 4-9 |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  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| ...                   |  |  |  | ...                |  |  |  | 81               |  |  |  | 21                               |  |  |  | ...           |  |  |  | ...             |  |  |  | ...             |  |  |  | ...             |  |  |  | ...  |  |  |  | 28  |  |  |  | 7-2 |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  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| 204                   |  |  |  | ...                |  |  |  | 239              |  |  |  | ...                              |  |  |  | 127           |  |  |  | ...             |  |  |  | 24              |  |  |  | ...             |  |  |  | 460  |  |  |  | ... |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  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| ...                   |  |  |  | ...                |  |  |  | 155              |  |  |  | ...                              |  |  |  | ...           |  |  |  | ...             |  |  |  | ...             |  |  |  | ...             |  |  |  | ...  |  |  |  | ... |  |  |  | 82  |  |  |  | ... |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  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| ...                   |  |  |  | ...                |  |  |  | 16               |  |  |  | ...                              |  |  |  | ...           |  |  |  | ...             |  |  |  | ...             |  |  |  | ...             |  |  |  | ...  |  |  |  | ... |  |  |  | ... |  |  |  | 63  |  |  |  | ... |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  |  |  |     |  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 |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  | ... |  |  |  |

<sup>1</sup> Exclusive of 1832.

† Dysentery and diarrhoea only—dyspepsia and obstipation being included with "other diseases." The figures prefixed to the names of the stations refer to their arrangement in the text.

We shall now proceed to make a few remarks on the more prevalent diseases among the troops at the various stations, and first of

### Fevers.

The following table shows the admissions and deaths by each type of fever in each of the three classes of stations.

|            | Stations on    | Sea coast. |      |         | Plains. |      |         | Table lands. |      |         |
|------------|----------------|------------|------|---------|---------|------|---------|--------------|------|---------|
|            |                | Adm.       | D.   | Propor. | Adm.    | D.   | Propor. | Adm.         | D.   | Propor. |
| Europeans. | Ephemeral,     | 800        | 21   | in 400  | 78      | ...  | 0 in 78 | 866          | 21   | in 433  |
|            | Quotid. inter. | 476        | 61   | in 79   | 98      | 11   | in 98   | 5178         | 361  | in 144  |
|            | Tertian,       | 72         | 11   | in 72   | 137     | 31   | in 46   | 1528         | 81   | in 191  |
|            | Remittent,     | 289        | 81   | in 36   | 10      | 21   | in 5    | 600          | 451  | in 13   |
|            | Continued,     | 2055       | 131  | in 158  | 1349    | 221  | in 61   | 3433         | 461  | in 74   |
|            | Total,         | 3692       | 301  | in 123  | 1672    | 281  | in 60   | 11605        | 1371 | in 85   |
|            | Ratio,         | 246        | 2    | ...     | 371     | 6.2  | ...     | 514          | 6.1  | ...     |
| Natives.   | Ephemeral,     | 5430       | 291  | in 187  | 3672    | 71   | in 524  | 9279         | 291  | in 320  |
|            | Quotid. inter. | 10248      | 1461 | in 70   | 11414   | 1451 | in 79   | 27743        | 3311 | in 84   |
|            | Tertian,       | 779        | 31   | in 260  | 378     | 21   | in 189  | 3310         | 261  | in 127  |
|            | Remittent,     | 288        | 321  | in 9    | 763     | 361  | in 21   | 2505         | 1151 | in 22   |
|            | Continued,     | 451        | 301  | in 15   | 527     | 422  | in 25   | 1690         | 831  | in 20   |
|            | Total,         | 17204      | 2401 | in 72   | 16754   | 2321 | in 72   | 44527        | 5841 | in 76   |
|            | Ratio,         | 2223.1     | ...  | ...     | 2183.   | ...  | ...     | 3594.7       | ...  | ...     |

From this table it appears that both among the Europeans and natives, fevers have been more prevalent and fatal at the stations on the table lands than at those on the coast or plains, a circumstance which shows that in India mere elevation above the level of the sea is not of itself sufficient to procure exemption from this class of diseases. On examining the prevalent types of fever among the European troops, ephemeral and continued will be found to have predominated on the coast in the proportion of three-fourths, and at the stations on the plains of five-sixths of the admissions by this class of diseases, while on the table lands two-fifths of the cases have been paroxysmal fevers. By reference to Table III. on page 77, it will be seen that of the stations on the table lands Bangalore is comparatively exempt from fevers, while the proportion is very high at Bellary, Secunderabad, and Kamptee. There is, however, this marked difference between the latter, that at Bellary one-third only of the cases are of a paroxysmal type, but at Secunderabad three-fourths, and at Kamptee five-sixths are of that character. This difference is, we think, sufficiently explained by reference to the description of these stations; the



country around Bellary being free from marshy ground, with the exception of the tank to the south-east of the fort; while Secunderabad, on the other hand, has been shown to abound in the alleged causes of fever. The cause of paroxysmal fever being prevalent at Kamptee is not quite so obvious, unless it arise from miasm generated in the numerous ravines and nullahs by which the country is intersected. This view as regards Secunderabad is corroborated by the want of success which has attended the alterations in the barracks. From a consideration of the difference in the nature of fevers at these stations, we would infer that measures tending to improve the barrack accommodation, and ameliorate the condition of the soldier at Bellary, would probably be attended with a diminution in the prevalence of these diseases, while, owing to their endemic origin at Secunderabad, the only measure appears to be that of removal to a more healthy locality. That such is to be found in the neighbourhood is proved by the health enjoyed by the cavalry at Bowenpilly, and by the Nizam's troops at Bolarum; the question therefore resolves itself into one of humanity and economy.

The excess of fevers among the Europeans, compared with the natives, is not so great as to lead to the supposition that it is a disease peculiarly affecting immigrants,—persons not indigenous to the country. There is, however, a very marked difference in the prevalent type in the two races. At the stations on the coast two-thirds of the cases among the natives have been paroxysmal fevers, while among the Europeans they have scarcely amounted to one-fourth; on the plains the proportion has been three-fourths among the natives, and about one-sixth among the Europeans; and on the table lands the relative proportions have been three-fourths and three-fifths respectively. Thus the prevailing form appears to be paroxysmal among the natives, and, with the exception of the table lands, continued among the Europeans. It is also interesting to observe, that the relative amount of paroxysmal fevers among the natives is very nearly the same in all the three classes of stations, and that the intensity of these diseases also very closely approximates, the proportion of deaths to admissions by fevers of all types ranging between 1 in 72 and 1 in 76.

The results shown by this table tend to disprove the theory, that the severe and fatal forms of fever by which Europeans suffer so much in the West Indies are the offspring of excessive heat and moisture alone. Were these alleged causes adequate to produce such an effect, then we ought to meet with remittent fever in its most aggravated form in the East, where the temperature is higher and the fall of rain greater than in the West;

and where in very many of the stations the refreshing influence of the sea breeze is not experienced. Such, however, is not the case, remittent fever being a source of but little sickness and mortality among the European troops, and during the period included in the reports before us, never having prevailed to a serious extent as an epidemic.

#### *Eruptive Fevers.*

This class of diseases has been a source of very little sickness and mortality. During five years, 1834-8, the admissions among the whole European force serving in the Presidency amounted only to 1 per 1000 of the strength, and among the native troops during the same period to  $7\frac{1}{2}$  per 1000, whereof three-fourths were cases of chicken-pox. The results in regard to small-pox are most satisfactory, as showing the exemption of the army in India from this dreadful scourge, and affording strong evidence of the success which has attended the measures adopted for the vaccination of the natives. During ten years, 1829-38, the admissions into hospital for small-pox among the European soldiers throughout the Madras army amounted only to 11, and the deaths to 1 in every 100,000 of the strength, and among the native soldiers during the same period the admissions were 73, and the deaths 7 out of the same numbers.

#### *Diseases of the Lungs.*

The admissions and deaths by this class of diseases have been as follows.

|            | Stations on             | Sea Coast. |     |     | Plains. |     |     | Table Lands. |      |      |         |
|------------|-------------------------|------------|-----|-----|---------|-----|-----|--------------|------|------|---------|
|            |                         | A          | d   | D.  | Propor. | Ad. | D.  | Propor.      | Ad.  | D.   | Propor. |
| Europeans. | Inflamma. of lungs,     | 239        | 12  | 1   | in 20   | 194 | 31  | in 65        | 466  | 141  | in 33   |
|            | Catarrh,                | 902        | 11  | 1   | in 82   | 163 | 41  | in 41        | 909  | 91   | in 101  |
|            | Consumption,            | 43         | 19  | 1   | in 24   | 2   | 11  | in 2         | 50   | 161  | in 3    |
|            | Asthma,                 | 38         | ... | 0   | in 38   | 12  | 21  | in 6         | 32   | ...  | 0 in 32 |
|            | Difficulty of breathing | 13         | 1   | 1   | in 13   | 18  | ... | 0 in 18      | 35   | 31   | in 12   |
|            | Total,                  | 1235       | 43  | 1   | in 29   | 389 | 101 | in 39        | 1492 | 422  | in 71   |
|            | Ratio per 1000,         | 82         | 2.9 | ... | ...     | 86  | 2.2 | ...          | 66   | 1.9  | ...     |
| Natives.   | Inflamma. of lungs,     | 83         | 19  | 1   | in 44   | 70  | 121 | in 6         | 149  | 332  | in 9    |
|            | Catarrh,                | 505        | 30  | 1   | in 163  | 314 | 91  | in 35        | 725  | 331  | in 22   |
|            | Consumption,            | 74         | 29  | 2   | in 5    | 48  | 281 | in 14        | 57   | 331  | in 14   |
|            | Asthma,                 | 244        | 15  | 1   | in 16   | 230 | 181 | in 13        | 244  | 241  | in 10   |
|            | Difficulty of breathing | 68         | 3   | 1   | in 23   | 49  | 31  | in 16        | 80   | 182  | in 9    |
|            | Total,                  | 974        | 96  | 1   | in 10   | 711 | 701 | in 10        | 1255 | 1411 | in 9    |
|            | Ratio per 1000,         | 121        | 1.2 | ... | ...     | 91  | .9  | ...          | 101  | 1.1  | ...     |

This table shows the mortality among the European troops by diseases of the lungs to have been lowest at the stations on the table

lands, and highest at those on the coast. This result, however, has been considerably influenced by the number of deaths at Madras, where the ratio by this class of diseases was nearly double that of the other stations, owing probably to the number of invalids who are assembled there at stated periods for embarkation to England. Omitting Madras, the mortality at the stations on the coast amounts to 2.3 per 1000, or almost the same as at those on the plain. The ratio both of admissions and deaths among the European troops is lower than what occurs among them when serving in their native country. The native troops have enjoyed a still greater immunity than the Europeans from this class of diseases, but particularly in the number of admissions. It is interesting in this particular to observe the influence of race on the character of the diseases from which exemption is thus enjoyed. If we classify the cases into inflammatory, including inflammation of the lungs and catarrh, and non-inflammatory, comprising consumption, asthma, and difficulty of breathing, we find that it is in the inflammatory that the difference almost entirely exists. This will be clearly seen from the following table, showing the admissions and deaths per 1000 of mean strength, divided in this manner.

| Stations on                                       | Sea Coast. |     |          |    | Plains.   |     |          |    | Table Lands. |    |          |    |
|---------------------------------------------------|------------|-----|----------|----|-----------|-----|----------|----|--------------|----|----------|----|
|                                                   | European.  |     | Natives. |    | European. |     | Natives. |    | European.    |    | Natives. |    |
|                                                   | Ad.        | D.  | Ad.      | D. | Ad.       | D.  | Ad.      | D. | Ad.          | D. | Ad.      | D. |
| Inflammation of lungs and catarrh,                | 76         | 1.5 | 7        | .6 | 79        | 1.5 | 5        | .3 | 61           | 1. | 7        | .5 |
| Consumption, asthma, and difficulty of breathing, |            |     |          |    |           |     |          |    |              |    |          |    |
|                                                   | 6          | 1.4 | 5        | .6 | 7         | .7  | 4        | .6 | 5            | .9 | 3        | .6 |

Thus it appears that a very marked difference exists in the prevalence and mortality of the inflammatory affections of the lungs, but that, allowance being made for the increased number of deaths from the invalids at Madras, the proportion of the non-inflammatory is nearly the same among Europeans and natives.

One of the most striking features in diseases of the lungs in this presidency is the low ratio of mortality as compared with other colonies, and the difference is chiefly to be found among those we have classed as non-inflammatory. The most important, because the most generally diffused and most fatal of these, is consumption, and in it, therefore, the difference will be found. As this is a subject of general interest, we submit the following

statement of the admissions and deaths at the principal colonies by this disease, from 1830 to 1836 inclusive, compared with those among the troops in the Madras Presidency.

|                                             |   |              |       | Strength. | Ad-<br>mitted. | Died. | Ratio per<br>1000 |      |
|---------------------------------------------|---|--------------|-------|-----------|----------------|-------|-------------------|------|
|                                             |   |              |       |           |                |       | Ad.               | Died |
| United Kingdom, - - -                       |   |              |       | 44,611    | 286            | 236   | 6                 | 5.3  |
| Gibraltar, - - -                            |   |              |       | 22,868    | 187            | 139   | 8                 | 6.1  |
| Malta, - - -                                |   |              |       | 15,031    | 101            | 54    | 7                 | 3.6  |
| Ionian Islands, - - -                       |   |              |       | 24,401    | 129            | 79    | 5                 | 3.2  |
| Bermuda, - - -                              |   |              |       | 5,894     | 47             | 38    | 8                 | 6.4  |
| Nova Scotia and New Brunswick,              |   |              |       | 16,082    | 109            | 89    | 7                 | 5.5  |
| Canada, - - -                               |   |              |       | 19,989    | 151            | 109   | 8                 | 5.4  |
| Cape of Good Hope, - - -                    |   |              |       | 6,957     | 34             | 17    | 5                 | 2.4  |
| Do. Frontiers,                              |   |              |       | 2,883     | 9              | 6     | 3                 | 2.1  |
| Do. Hottentots, *                           |   |              |       | 4,136     | 14             | 10    | 3                 | 2.4  |
| W. and L. Command, - - -                    |   |              |       | 33,839    | 389            | 218   | 11                | 6.4  |
| Do. Black troops,                           |   |              |       | 9,442     | 65             | 49    | 7                 | 5.2  |
| Jamaica, - - -                              |   |              |       | 18,817    | 253            | 139   | 13                | 7.4  |
| Do. Black troops, - - -                     |   |              |       | 2,008     | 7              | 6     | 3½                | 3.   |
| Mauritius, - - -                            |   |              |       | 13,162    | 96             | 51    | 7                 | 3.9  |
| Ceylon, - - -                               |   |              |       | 14,590    | 78             | 51    | 5                 | 3.5  |
| Madras.<br>Euro-<br>Na-<br>tives.<br>peana. | { | Sea Coast,   | - - - | 14,992    | 43             | 19    | 3                 | 1.3  |
|                                             |   | Plains, -    | - - - | 4,502     | 2              | 1     | ½                 | .2   |
|                                             |   | Table Lands, | - - - | 22,583    | 50             | 16    | 2                 | .7   |
|                                             |   | Sea Coast,   | - - - | 77,504    | 74             | 29    | 1                 | .4   |
|                                             |   | Plains,      | - - - | 176,877   | 46             | 28    | 3                 | .4   |
|                                             |   | Table Lands, | - - - | 23,929    | 57             | 33    | 1                 | .3   |

This table clearly shows the low ratio of consumption among the troops in Madras, both European and native. But it may be alleged that consumption being a chronic disease, this result, as regards mortality, may have been to a slight extent influenced by men labouring under it being sent home as invalids. The information with regard to the diseases for which they are invalided is not sufficiently detailed to enable us to enter minutely into that question, but it still warrant us in concluding that this will not account for the low rate of mortality. In ten years, 1829-38, the ratio per 1000 of the mean strength of European troops throughout the presidency, invalided for "thoracic diseases" was 2, and of native troops 0.6 annually, a proportion as regards Europeans the same as that which occurs at Gibraltar, and lower than at any colony except the Ionian Islands and Jamaica.

These results sufficiently show that the exemption from consumption in the East is not one dependent on race but resulting from climate. But while we state this as our opinion, we are

\* For a period of thirteen years, 1822-34.

unable to offer any satisfactory explanation of the fact. Those who maintain that marsh miasma is a specific against tubercular consumption will doubtless attribute it to the extent of marsh, which is met with through the greater part of the presidency. But if so, how are we to account for its prevalence in the West Indies, where the antidote is equally abundant, while the colony in which the mortality from it is lowest is the Cape of Good Hope, which is remarkably free from all sources of miasm?

The frequency of consumption in the West Indies has been attributed by some to the influence of the sea breeze in checking the profuse perspiration which attends the slightest exertion in the heat of the sun; but such a result is not obvious in India. It is also worthy of remark that the mortality is exactly the same among the native troops on the coast and table lands, although the range of the thermometer at the latter is much greater, and the temperature during several months is considerably under that of the low grounds.

The results in the preceding table are of practical value in assisting the physician to select a climate suited for patients pre-disposed to pulmonary consumption. It was at one time the practice to send such to the West Indies; but statistical investigations have shown that, *cæteris paribus*, they were there exposed to even greater risk from it than at home. In India, however, the reverse is the case, and there is no British colony which appears so suitable or so likely to prove beneficial to this class of patients.

#### *Diseases of the Liver.*

Under this head are comprised

| Stations on                                | Sea Coast. |     |         | Plains. |     |         | Table Lands. |     |         |
|--------------------------------------------|------------|-----|---------|---------|-----|---------|--------------|-----|---------|
|                                            | Ad.        | D.  | Prop.   | Ad.     | D.  | Prop.   | Ad.          | D.  | Prop.   |
| Europeans. Acute infla. }<br>Chronic do. } | 1842       | 84  | 1 in 22 | 439     | 14  | 1 in 31 | 2269         | 105 | 1 in 22 |
|                                            |            |     |         | 42      | 1   | 1 in 42 | 460          | 30  | 1 in 15 |
| Total, .                                   | 1842       | 84  | 1 in 22 | 481     | 15  | 1 in 32 | 2729         | 135 | 1 in 20 |
| Ratio, .                                   | 123        | 5·6 |         | 107     | 3·3 | ...     | 121          | 6·  | ...     |
| Natives. Inflammation,                     | 77         | 10  | 1 in 8  | 59      | 14  | 1 in 4  | 97           | 8   | 1 in 12 |
| Ratio, .                                   | 1          | ·1  | ...     | 1       | ·2  | ...     | 1            | ·1  | ...     |

This table shows a remarkable diversity both in the prevalence and mortality of inflammation of the liver among the European as compared with the native troops. Among the latter it is so very trifling as scarcely to require notice, while it is more

prevalent and more fatal among the Europeans than in any other of our colonies. The same feature is found in the case of troops in the West Indies, where the negroes enjoy a considerable exemption compared with the Europeans. These results may be influenced to some extent by the mode of living and habits of the two classes of troops, especially as regards the use of intoxicating liquors; but this is by no means adequate to explain the difference. The proportion of cases among the Europeans has been very nearly the same on the table lands as the sea coast, and the deaths have been even a little higher. Among the native troops the exemption has been enjoyed alike in all the divisions.

*Diseases of the Bowels.*

|            | Stations on      | Sea Coast. |      |         | Plains. |      |         | Table Lands. |      |         |
|------------|------------------|------------|------|---------|---------|------|---------|--------------|------|---------|
|            |                  | Ad.        | D.   | Propor  | Ad.     | D.   | Propor. | Ad.          | D.   | Propor  |
| Europeans. | Acute dysentery, | 2664       | 174  | 1 in 15 | 642     | 54   | 1 in 12 | 3465         | 340  | 1 in 10 |
|            | Chronic do.      | 71         | 11   | 2 in 13 | 8       | 3    | 1 in 23 | 179          | 18   | 1 in 10 |
|            | Diarrhoea, .     | 1322       | 21   | 1 in 63 | 70      | ..   | 0 in 70 | 1685         | 34   | 1 in 50 |
|            | Total, .         | 4057       | 206  | 1 in 20 | 720     | 57   | 1 in 13 | 5329         | 392  | 1 in 14 |
|            | Ratio, .         | 271        | 13·7 | ..      | 160     | 12·7 | ...     | 236          | 17·4 | ...     |
| Natives.   | Dysentery, .     | 832        | 88   | 2 in 19 | 719     | 55   | 1 in 13 | 1267         | 142  | 1 in 9  |
|            | Diarrhoea, .     | 1181       | 72   | 1 in 16 | 514     | 44   | 1 in 21 | 2476         | 84   | 1 in 29 |
|            | Total, .         | 2013       | 160  | 1 in 13 | 1633    | 99   | 2 in 33 | 3743         | 226  | 1 in 17 |
|            | Ratio, .         | 26         | 2·1  | ...     | 21      | 1·3  | ...     | 30           | 1·8  | ...     |

Diseases of the bowels, though less prevalent among the European troops than fevers, are more fatal, being the cause of upwards of two-fifths of the mortality. The great majority of the cases are dysentery and diarrhoea, and it will be observed that these have proved most fatal at the stations on the table lands, a result attributable to the great prevalence and fatal character of dysentery at Secunderabad. During five years, 1834-8, the admissions at that station by dysentery alone amounted to 1591, and the deaths to 235, being in the ratio of 327 and 48·3 per 1000 of mean strength. We have already stated our opinion of the necessity of removing the troops quartered there to a more healthy situation, on account of the amount of endemic fever from which they suffer, and this fearful mortality from malarious dysentery greatly strengthens our opinion. If Secunderabad be omitted, the admissions at the other stations on the table lands by dysentery and diarrhoea amount only to 186, and the deaths to 8·6 per 1000 of the strength. It ap-

pears, therefore, highly expedient to remove the European troops from this garrison. Among the coast stations dysentery is nearly twice as fatal at Cannanore as at any of the others, and has of late years been on the increase.

Dysentery and diarrhoea are not sources of great sickness or mortality among the native troops, a circumstance which may perhaps in some measure be attributable to their habits of living.

Dyspepsia and constipation, the other two diseases included under this class, do not give rise to a large proportion of admissions or deaths among the troops. They are more prevalent at those stations at which we have found fever and dysentery to abound than at the others. The ratio among the native troops is very slightly higher than among the troops in the united kingdom. The mortality from these two diseases does not amount to more than 3 deaths in every 10,000 of the strength, and is almost exactly the same among Europeans and natives.

### *Cholera.*

A reference to the tables in the preceding pages will show to what extent cholera has been a source of sickness and mortality at the different stations. The information contained in the reports relative to the various outbreaks of this disease is so scanty that we are unable satisfactorily to enter upon the subject.

### *Diseases of the Brain.*

The following diseases have been included under this class.

| Stations on           | Sea Coast. |     |         | Plains. |     |         | Table Lands. |     |         |
|-----------------------|------------|-----|---------|---------|-----|---------|--------------|-----|---------|
|                       | Ad.        | D.  | Prop.   | Ad.     | D.  | Prop.   | Ad.          | D.  | Prop.   |
| Apoplexy, .....       | 9          | 8   | 8 in 9  | 11      | 7   | 2 in 3  | 37           | 20  | 1 in 2  |
| Palsy, .....          | 24         | ... | 0 in 24 | 27      | 2   | 2 in 27 | 81           | 13  | 1 in 6  |
| Epilepsy, .....       | 61         | 1   | 1 in 61 | 24      | 1   | 1 in 24 | 107          | 5   | 1 in 22 |
| Fatuity, .....        | 19         | ... | 0 in 19 | 3       | ... | 0 in 3  | 5            | ..  | 0 in 5  |
| Madness, .....        | 25         | 3   | 1 in 8  | ...     | ... | ...     | 25           | 2   | 2 in 25 |
| Total, .....          | 138        | 12  | 2 in 22 | 65      | 10  | 2 in 13 | 255          | 40  | 2 in 13 |
| Ratio per 1000, ..... | 17         | 1·5 | ...     | 15      | 2·2 | ...     | 11           | 1·6 | ...     |
| Apoplexy, .....       | 16         | 10  | 2 in 3  | 16      | 12  | 3 in 4  | 15           | 9   | 2 in 3  |
| Palsy, .....          | 106        | 10  | 2 in 21 | 59      | 10  | 1 in 6  | 119          | 11  | 1 in 11 |
| Epilepsy, .....       | 28         | 6   | 2 in 9  | 19      | 3   | 1 in 6  | 58           | 5   | 1 in 12 |
| Fatuity, .....        | 45         | 6   | 2 in 15 | 19      | 1   | 1 in 19 | 45           | 3   | 1 in 15 |
| Madness, .....        | 72         | 3   | 1 in 24 | 47      | 2   | 2 in 47 | 117          | 4   | 1 in 29 |
| Total, .....          | 267        | 35  | 2 in 15 | 160     | 28  | 1 in 6  | 354          | 32  | 1 in 11 |
| Ratio per 1000, ..... | 4          | ·5  | ..      | 3       | ·5  | ...     | 3            | ·3  | ...     |

The ratio of admissions and deaths among the native troops corresponds very closely with that in the United Kingdom, and the intensity of the diseases is exactly the same, the proportion of deaths to admissions being 1 in 8. Among the European troops the ratio is rather more than thrice as high as when serving in their native country.

In the preceding table we have not inserted *delirium tremens*, because in the returns from several stations it has been included among "other diseases." On calculating the ratio at those stations from which the returns are available, we find the admissions in the five years 1834-8 to have amounted to 17, and the deaths to 0·7 per 1000 of mean strength. This is a higher proportion of cases than in any of the colonies, except the Windward and Leeward Command and Mauritius. But high as the ratio is, it still presents too favourable a view of the amount of intemperance among the European troops in Madras, for during the same period there have been admitted into hospital at these stations, 1987 cases under the head of "ebrietas," being in the ratio of 54 per 1000 of mean strength. From the general return for the Madras Presidency, it appears that in ten years, 1829-38, the admissions by *delirium tremens* averaged  $31\frac{1}{2}$ , and the deaths 0·5 per 1000 annually among the European soldiers; while among the natives the cases did not quite amount to 0·2, and the deaths to 0·01 per 1000 of mean strength. During the same period the admissions for "ebrietas" were 49 per 1000 of the Europeans, and none occurred among the natives. While the preceding results show a considerable diminution in the cases of *delirium tremens* during the last five years of the period, they afford melancholy evidence that intemperance is still a very prevalent vice among the European troops in India. There can be little doubt that this was greatly fostered by the practice of issuing a daily spirit ration to each soldier, thereby training him to habits of intemperance. We understand that this pernicious custom has now been abolished in India, as it was in the other British possessions in 1830 by Lord Hardinge, then Secretary at War. The soldier is too willing to fly to the bottle to drown his cares and relieve the dull monotony of his career, without any such encouragement as the gratuitous distribution of spirits.



*Dropsies.*

Under this head are comprised,

|            | Stations on          | Sea Coast. |     |            | Plains. |     |            | Table Lands. |     |            |
|------------|----------------------|------------|-----|------------|---------|-----|------------|--------------|-----|------------|
|            |                      | Ad.        | D.  | Proportion | Ad.     | D.  | Proportion | Ad.          | D.  | Proportion |
| Europeans. |                      |            |     |            |         |     |            |              |     |            |
|            | Subcutaneous dropsy, | 51         | 12  | 1 in 4     | 13      | 1   | 1 in 13    | 81           | 9   | 1 in 9     |
|            | Abdominal dropsy,    | 14         | 4   | 2 in 7     | 1       | ... | 0 in 1     | 41           | 7   | 1 in 6     |
|            | Beriberi, . . . .    | ...        | ... | ...        | ...     | ... | ...        | 2            | ... | 0 in 2     |
|            | Total,               | 65         | 16  | 1 in 4     | 14      | 1   | 1 in 14    | 124          | 16  | 1 in 8     |
|            | Ratio per 1000,      | 8          | 2   | ...        | 3       | 2   | ...        | 6            | 7   | ...        |
| Natives.   |                      |            |     |            |         |     |            |              |     |            |
|            | Subcutaneous dropsy, | 159        | 42  | 1 in 4     | 107     | 14  | 1 in 8     | 276          | 56  | 1 in 5     |
|            | Abdominal dropsy,    | 31         | 14  | 1 in 2     | 32      | 13  | 2 in 5     | 29           | 12  | 2 in 5     |
|            | Beriberi, . . . .    | 399        | 46  | 1 in 8     | 677     | 97  | 1 in 7     | 69           | 15  | 2 in 9     |
|            | Total,               | 589        | 102 | 1 in 6     | 316     | 124 | 2 in 13    | 374          | 85  | 2 in 9     |
|            | Ratio per 1000,      | 8          | 1.3 | ...        | 14      | 2.2 | ...        | 3            | 7   | ...        |

This class of diseases has not given rise to much sickness and mortality among the Europeans; except at the stations on the coast the ratio is lower than among the troops in the West Indies, and at all the stations it is lower than in Ceylon. The natives have suffered to a considerable extent from beriberi, a disease from which the Europeans have been almost exempt, two cases only having occurred out of the whole force. It has been confined almost entirely to the stations on the coast and plains, between the 16th and 20th degrees of latitude, a circumstance pointed out by Mr Malcolmson in his admirable essay on this disease.\* Exceptions to this rule will be found in the occurrence of 24 cases at Salem, of which 17 died; of 31 at Secunderabad, whereof 5 were fatal; and of 22 at Kamptee, 6 of which died. Several of these, however, were in men recently arrived from the coast. One or two isolated cases have occurred at other stations. The following statement of the number of admissions and deaths at each of the stations within the above limits may perhaps be considered interesting.

|                    | Admitted. | Died. |                   | Admitted. | Died. |
|--------------------|-----------|-------|-------------------|-----------|-------|
| Masulipatam, ..... | 130       | 22    | Vizianagrum, ...  | 418       | 50    |
| Vizagapatam, ..... | 21        | 6     | Berhampore, ..... | 92        | 12    |
| Chicacole, .....   | 243       | 16    | Russelcondah, ... | 16        | 4     |
| Rajahmundry, ..... | 38        | 3     |                   |           |       |
| Samulcottah, ..... | 81        | 11    | Total,            | 589       | 124   |

If the ratios of these numbers be calculated upon the aggre-

\* A Practical Essay on the History and Treatment of Beriberi, by Assistant Surgeon J. G. Malcolmson, Madras Medical Establishment. Madras, 1835.

gate strength of the stations at which the cases occurred, we find the admissions to be 9 and the deaths 1·9 per 1000 annually. The causes which give rise to this disease are still involved in obscurity and a long and patient accumulation of facts is the only means likely to throw light upon the subject.

### *Rheumatism*

has prevailed among the native troops to nearly the same extent at all the classes of stations, ranging between 52 per 1000 on the table lands, and 58 per 1000 on the plains. These ratios hold an intermediate place between those of troops in the United Kingdom and the Cape corps at the Cape of Good Hope, which are respectively 48 and 67 per 1000 of the strength.

The ratio of admissions among the Europeans has been rather more than double that of the native soldiers. It amounted to 113 per 1000 at Trichinopoly, 124 at the stations on the table lands, and 126 on the sea coast.

It will be found from the tables in the preceding pages, that while among the Europeans diseases of the eyes considerably exceed in frequency those of the skin, the reverse is the case with the natives. In the United Kingdom, as with the Sepoys in their native country, the affections of the skin predominate over those of the eyes. The amount of skin diseases among the Europeans in Madras is very low, particularly when we consider the important functions the skin performs in warm climates, and the constant stimulus of heat to which it is exposed.

Having concluded these observations on the principal classes of diseases, we think it necessary to observe that the sickness and mortality shown in the preceding pages is only that to which the troops are subject at the various stations therein described. The losses by death in the field and on the march have not been included, as the reports from which this paper has been drawn up do not afford any information on these points. We trust that the Statistical Report on the health of H. M. army in India, in continuation of those already published, on "the Sickness, Mortality, and Invaliding of the Troops at Home and in the Colonies," will be soon prepared, as it will doubtless contain much valuable information on these important and interesting topics.

The facts contained in the preceding paper point out, we think, the necessity for a careful attention to selection of the site for a cantonment. It has been shown that there are stations in India where the mortality among European soldiers is little higher than in their native country, and that even where this is not the case, different localities, within a short distance of each other, possess very different degrees of salubrity. It is true that

occasionally military or political reasons exist, rendering necessary the occupation of an insalubrious spot; but where this is not the case, competent medical officers should be directed to investigate and report upon the sanitary condition of any place which is intended to be occupied as a military station.

The utility, also, of a system of periodical reports from all medical officers must be obvious, as affording information to the authorities on the state of the health of the army, and bringing under their notice any extraordinary amount of sickness and mortality that may occur in it. An opportunity would thus be afforded of directing an inquiry into the origin and progress of the disease by which it was produced, and if practicable of removing or mitigating its causes. The attention of the medical officers would also be more constantly directed to the sanitary state of the troops, and the measure would thus be attended with a progressive improvement in their professional acquirements. To effect these ends, however, not only are periodical reports necessary, but arrangements must be made to have these brought under the notice of the responsible authorities in a condensed form without unnecessary delay. Unless such an arrangement be adopted, the system of periodical reports must lose much of its practical value. They may serve at a future period to elucidate many points in medical science, but they will be inoperative in promoting the welfare of the soldier, at least until in many instances he has gone through a career of suffering which he might possibly have been spared. Humanity and economy alike demand this, for a little calculation will prove that the expense of preserving the soldier in health and efficiency is much less than that of replacing him, and that in this, as in most other cases, prevention is better than cure.

The documents from which this report has been prepared were printed by order of the Madras Government, but not published, the distribution of copies being confined to certain classes of officers in their own service. Our object has been to make the results of the investigation more generally known, in the hope of directing attention to the important subject of improving the health and maintaining the efficiency of soldiers; the first step towards which obviously is, to ascertain to what diseases they are most liable, and to what extent, in the different situations in which they are placed. It seems very desirable, that while the Indian Government bring the subject of the sanitary condition of the soldiers under the notice of their officers, by the gratuitous distribution of these reports, they should, by the publication of the documents, place the information within reach of the army and the public generally.



TABLE VI.—Showing the Sickness and Mortality among the Native Troops serving at the following Stations in the Madras Presidency from 1829 to 1838 inclusive.

| TABLE LAND. |                                    |       |         |        |                  |         |                       |       |                           |        |          |         |        |       |     |     |     |     |
|-------------|------------------------------------|-------|---------|--------|------------------|---------|-----------------------|-------|---------------------------|--------|----------|---------|--------|-------|-----|-----|-----|-----|
| SEA COAST.  |                                    |       | Madras. |        | Mysore Division. |         | Bellary and Cuddapah. |       | Secunderabad and Jaulnah. |        | Kamptee. |         |        |       |     |     |     |     |
|             | Cannanore, Mangalore, and Calicut. |       | Streng. | Admit. | Died.            | Streng. | Admit.                | Died. | Streng.                   | Admit. | Died.    | Streng. | Admit. | Died. |     |     |     |     |
| 1829        | 5980                               | 2552  | 47      | 7956   | 3454             | 62      | 7095                  | 3214  | 81                        | 1596   | 53       | 9860    | 4986   | 75    |     |     |     |     |
| 1830        | 5601                               | 3019  | 75      | 9546   | 3619             | 63      | 6586                  | 2546  | 54                        | 4998   | 1431     | 9036    | 3649   | 96    |     |     |     |     |
| 1831        | 5008                               | 2367  | 37      | 7658   | 3370             | 64      | 6204                  | 4209  | 140                       | 3879   | 1354     | 55      | 8694   | 3887  |     |     |     |     |
| 1832        | 4569                               | 2006  | 54      | 7025   | 3033             | 58      | 7459                  | 4785  | 138                       | 3222   | 1595     | 45      | 8656   | 3573  |     |     |     |     |
| 1833        | 2853                               | 1442  | 34      | 7704   | 3652             | 112     | 7291                  | 5197  | 145                       | 3532   | 1745     | 136     | 8052   | 4437  |     |     |     |     |
| 1834        | 3098                               | 2076  | 51      | 4863   | 2305             | 65      | 5860                  | 6037  | 113                       | 3009   | 2221     | 28      | 8425   | 6361  |     |     |     |     |
| 1835        | 2703                               | 1756  | 43      | 3918   | 1642             | 34      | 8053                  | 6032  | 90                        | 3361   | 2552     | 22      | 7890   | 6731  |     |     |     |     |
| 1836        | 2502                               | 1465  | 29      | 3755   | 1837             | 42      | 7617                  | 5298  | 71                        | 2739   | 1707     | 21      | 7885   | 4646  |     |     |     |     |
| 1837        | 3535                               | 3027  | 36      | 3930   | 1628             | 79      | 7073                  | 4936  | 79                        | 3150   | 1352     | 39      | 7829   | 3571  |     |     |     |     |
| 1838        | 3944                               | 2958  | 101     | 3787   | 1404             | 82      | 6658                  | 4842  | 85                        | 3335   | 2251     | 145     | 7625   | 5657  |     |     |     |     |
| Total,      | 39743                              | 22668 | 507     | 60142  | 25944            | 661     | 70016                 | 46976 | 991                       | 35999  | 17804    | 581     | 81042  | 46478 |     |     |     |     |
| Ratios.     | 1829                               | ...   | 430     | 79     | ...              | 434     | 78                    | 453   | 114                       | ...    | 334      | 111     | ...    | 438   |     |     |     |     |
| 1830        | ...                                | 539   | 134     | 74     | ...              | 379     | 66                    | 387   | 82                        | ...    | 286      | 74      | ...    | 404   |     |     |     |     |
| 1831        | ...                                | 473   | 74      | ...    | ...              | 440     | 83                    | 678   | 226                       | ...    | 349      | 142     | ...    | 389   |     |     |     |     |
| 1832        | ...                                | 439   | 116     | ...    | ...              | 432     | 82                    | 641   | 178                       | ...    | 485      | 14      | ...    | 413   |     |     |     |     |
| 1833        | ...                                | 505   | 119     | ...    | ...              | 474     | 145                   | 705   | 199                       | ...    | 494      | 385     | ...    | 551   |     |     |     |     |
| 1834        | ...                                | 670   | 165     | ...    | ...              | 474     | 134                   | 1010  | 169                       | ...    | 738      | 98      | ...    | 1172  |     |     |     |     |
| 1835        | ...                                | 650   | 159     | ...    | ...              | 419     | 87                    | 749   | 112                       | ...    | 759      | 65      | ...    | 843   |     |     |     |     |
| 1836        | ...                                | 536   | 116     | ...    | ...              | 499     | 112                   | 688   | 93                        | ...    | 623      | 77      | ...    | 589   |     |     |     |     |
| 1837        | ...                                | 536   | 102     | ...    | ...              | 414     | 201                   | 697   | 111                       | ...    | 429      | 124     | ...    | 456   |     |     |     |     |
| 1838        | ...                                | 750   | 256     | ...    | ...              | 371     | 216                   | 727   | 126                       | ...    | 675      | 495     | ...    | 768   |     |     |     |     |
| Mean,       | ...                                | 570   | 127     | ...    | ...              | 431     | 11                    | 671   | 141                       | ...    | 495      | 161     | ...    | 573   |     |     |     |     |
|             |                                    |       |         |        |                  |         |                       |       |                           |        |          |         |        |       | 149 | ... | 624 | 125 |

**ART. III.—*Report of Cases, &c. brought before the Liverpool Pathological Society, Session 1846-47, which were illustrated by Pathological Specimens, Drawings, Casts, &c. With the Secretary's Address.***

*Address by the Secretary, JAMES TURNBULL, M. D., Physician to the Liverpool Northern Hospital.*

MR PRESIDENT AND GENTLEMEN,—In laying before you a summary of the proceedings of this the fourth session, I may be allowed to congratulate the members on the continued interest which is taken in the objects of the society,—an interest which has been evinced by the amount of valuable matter brought under our notice, as well as by the increase of new members; and we may now feel assured that this has arisen not from the novelty of joining a new society, but from a real desire to take a part in our discussions, and to draw from examination of the lesions of structure so regularly exhibited here, such practical instruction regarding the causes, the course, and the effects of diseases on different organs, as may, when similar forms present themselves in practice, enable us to combat them with the greatest prospect of success.

Studied with this view, and not from mere curiosity, the field of pathological anatomy will, notwithstanding the advances it has made of late years, be still found capable of affording abundant materials for profitable observation and reflection; and this opinion seems to be generally entertained, if we may judge from the formation during the last year of a pathological society in London, and of another in one of our largest provincial towns.

My duty is confined to laying before you a retrospective review of the proceedings of the past session. I am sure, however, that if each member would for himself look back upon the four preceding years, he must admit that he has derived much sound instruction, from the direct appeal to the senses, made by the exhibition of specimens, casts, and drawings, and from the accounts of cases given by so many labourers co-operating for the purpose of mutual instruction.

Our opportunities of examining diseases of the nervous system have not been more numerous than in former years. An interesting case of apoplexy has been brought before us, where blood was effused beneath the arachnoid, and a clot was found between the optic commissure and the pons, involving the nerves in this situation. The blood had escaped from a small aneurism the size of a pea of the left posterior cerebellic branch of the basilar artery. A case of aneurism of the middle meningeal artery, in a girl 12 years of age, was at same time related, where sudden death occurred from rupture of the sac, and effusion of blood over the whole of one hemisphere.

A cast taken from a tumour of the orbit has been exhibited, the diagnosis as to the nature of which was very obscure. Drawings have also been shown of a peculiar form of ulceration of the eyelid, supposed to be dependent upon a strumous diathesis. Three cases were detailed, two of which occurred in men, the other in a woman. Two of them recovered under the use of tonics with nourishing diet. We have examined a drawing of a deposit in the capsule of the lens, caused by a blow, and scarcely affecting vision; and one also of a deposit in the lens of both eyes, resulting from chronic ophthalmia of twenty years' standing, and rendering vision very defective.

Most of the cases of pulmonary disease have either been of a rare description, or accompanied by some circumstances rendering them more than ordinarily interesting.

A case of scirrhus disease of the right lung, situated at the root, and penetrating round the vessels and tubes, has been exhibited. There was also a tumour of an encephaloid nature, which surrounded and compressed the *vena cava* above the entrance of the azygos vein, and thus, by obstructing the return of the blood from the superior parts of the body, produced great œdema of the face and front of the chest, with enlargement of the cutaneous veins.

A case of empyema, caused by a blow from the handle of a winch, has been detailed, where an enormous quantity of pus was accumulated in the right side of the chest. The want of a history of the case on admission from the patient being unable to speak English, and the presence of abdominal pain and diarrhœa, prevented the more important disease from being discovered, until decubitus on one side caused a suspicion of pleuritis, and led to an examination, by which it was easily detected. It was in consequence of the failure in a similar case of the ordinary means to reduce the quantity of fluid effused; that Dr Carson was induced to propose a new plan of performing the operation of *paracentesis thoracis*, which has been fully detailed in the *Lancet*.

A case of pleuritic contraction of the left side of the chest, with destruction of the pulmonary tissue and dilatation of the bronchi, followed also by enlargement of the heart, has been brought before the society. The case showed forcibly the importance of giving due weight to the general symptoms while estimating the value of physical signs, for on one hand the physical signs, denoting the existence of cavities in the lung, were well marked; whilst on the other some of the most important symptoms of phthisis were wanting.

A tumour the size of a small apple, consisting of crude tubercular matter, and situated at the summit of the right lung, has been shown. The gentleman, who was 67 years of age, was ill for two years, and consulted various medical men, who failed to

discover the nature of the disease until a short time before death, when the ordinary symptoms of dyspnoea, purulent expectoration, and emaciation supervened.

Diseases of the heart have scarcely occupied as prominent a place in our proceedings as in previous years. But we have had some curious cases of disease of the arteries and veins; and a paper on varicose veins, illustrated by a cast, and containing some important practical observations on the treatment of this disease, has been read to the society.

An opportunity has been afforded us of examining a case or recent and extensive endocarditis, arising from exposure to cold, without any rheumatic affection. Though the complication of this formidable disease with bronchitis and pleuro-pneumonia had been discovered, and the treatment directed accordingly, the death of the patient occurred somewhat suddenly, and was scarcely expected, as the violence of the symptoms had much abated.

Two cases of sudden death have been related. In one there was rupture of the aorta from disease of the coats, and extravasation of blood into the pericardium. In the other, the patient, who was recovering from erysipelas, died suddenly, after walking across the ward. Large warty vegetations were found on the aortic valves, and there was an aneurismal pouch, the size of a walnut, apparently formed by enlargement of the sinuses of Morgagni.

In addition to the case of aneurism of a branch of the basilar artery already noticed, one of the arch of the aorta, of large size, has been shown, where the patient was subject to occasional attacks of dyspnoea for two years, but continued able to follow his employment as a carpenter, until he was suddenly seized with a severe paroxysm while conversing with a friend on the street. He was not relieved by being twice bled, and died two days after, without rupture of any of the coats.

A case of wound of the epigastric artery, causing death by hemorrhage into the abdominal cavity, with scarcely any bleeding externally, has been related.

We have examined a curious case of aneurismal varix, about the size of an orange, and situated over the angle of the jaw. When introduced to the society, the woman stated that the tumour had been present for 25 years, and had been caused by the point of a penknife being driven in below the angle of the jaw. Some pain was experienced on pressure, a thrilling sensation could also be felt with the hand, and on applying the stethoscope a very loud murmur of remittent intensity, and exactly like the swelling murmur heard in the veins of the neck in cases of chlorosis, was audible.

A case of adhesive phlebitis of the vena cava has been detailed, where this vessel, as well as the right common iliac and femoral veins, down to the popliteal, and also the left common iliac, were completely choked up with fibrinous matter.



For the cure of varicose veins, the treatment, by the application of *potassa fusa* at one or more parts in the course of the vessel, so as to produce a slough, and cause obliteration of the vein by exciting adhesive inflammation, has been strongly recommended. The results of 43 cases have been laid before us, from which it would seem that this treatment is not only safe but generally successful. 34 cases occurred in hospital practice, 5 of which returned with the disease, and 1 was incurable.

We have had before us three cases of disease of the blood. Two were cases of scurvy, a disease which many medical men believe to be now almost unknown, but which, though happily eradicated almost completely from the British navy, continues still to commit its ravages to a very considerable extent among seamen of the merchant service, owing to due attention not being paid to sanitary regulations. In one of the cases it is not improbable that the patient might have recovered, had mercury, which proves very deleterious in this disease, not been imprudently given before his admission. Blood was found effused beneath the periosteum of both tibiæ and into the surrounding cellular tissue. In the second case, in addition to similar appearances, ulceration of the follicles near the pylorus, and a remarkable purple black appearance of the large intestine were discovered.

The other case of disease of the blood was one of acute *purpura hæmorrhagica*,—a disease allied to scurvy. No morbid appearances could be discovered in any of the secreting organs; but the globules of the blood when examined with the microscope were found to be completely disorganized.

The epidemic dysentery which proved so fatal last summer and autumn, was still prevalent at the time our meetings commenced; and three cases of this disease, besides one of tropical dysentery with abscess of the liver, have been brought under our notice. In one of the former, the mucous membrane was very vascular, with some appearance of abrasion, and the follicles were enlarged. In another the morbid appearances were more characteristic. The mucous membrane of the whole of the large intestines was vascular, and there was a multitude of small ulcers seated in the follicles. The mesenteric glands were also enlarged and inflamed. In the third the appearances were altogether different; lymph being abundantly effused on the mucous surface, the coats much thickened, and the ulcers of large size.

In the case of tropical dysentery the coats were likewise much thickened and the ulcers large, especially in the sigmoid flexure. The occurrence of abscesses in the liver in this case and their absence not only in the preceding, but in most, if not all, those where members had opportunities of examining fatal cases of the epidemic dysentery, would seem unfavourable to Dr Budd's view, that abscess of the liver is a secondary affection, dependent upon

absorption by the veins of the purulent matter of the ulcers, and would rather show that they are dependent upon a common cause most efficient in hot climates.\*

Our discussion on the treatment of this disease showed that the practice of different individuals varied considerably. While depletion, even locally, would seem to have been but rarely employed, mild aperients were invariably given for the purpose of unloading the intestinal canal, and by some with the view of deriving further benefit from their purgative operation. Opium in some form would appear to have been used by every one, and to have been regarded by many as the main remedy. The propriety of giving calomel was called in question by some; while others found benefit from giving it in small doses combined with opium, and even from continuing it in obstinate cases until the gums were affected.

In addition to these cases of dysentery, we have had an opportunity of examining one of ulceration of the large intestines, in a child, where this disease followed measles.

An exceedingly well-marked specimen of typhoid enlargement and ulceration of the Peyerian glands, at the lower end of the ileum, showing the disease as it occurred in almost all the fatal cases in the Fever Hospital during last season, has been presented. Towards the ileo-cæcal valve, the glands were in a state of ulceration, but considerably above this, they were simply enlarged.

A singular case has been shown of stricture of the jejunum, with destruction of a circular portion of mucous membrane; apparently dependent upon contraction of the circular muscular fibres, from some cause which could not be clearly ascertained. In this, as well as in a curious case of adhesions causing twisting of the intestines, the symptoms were those of ileus or strangulated hernia.

An interesting case has been detailed, where a large quantity of the extract of belladonna, more than half a drachm, was taken by mistake, instead of taraxacum. The boy's life was probably saved by the fortunate circumstance of vomiting having occurred. The ordinary symptoms of delirium, dilated pupils, and afterwards coma supervened; also intermittent pulse—a symptom not usually noticed in works on toxicology. The patient could not see distinctly for five days; and ten elapsed before all the symptoms had disappeared.

Two cases of soft cancer of the liver have been related. In both there was scirrhus disease of the pylorus and of the mesenteric glands, and in one there was also cancerous disease of the pancreas and lungs. There was great enlargement and pain in the

\* When the close relation subsisting between dysentery and suppurative disease of the liver in India is considered, it cannot but appear remarkable that, among the many hundreds of cases which have occurred in the Millbank prison during the last seven years, not one has been complicated with hepatic abscess.—Dr Baly's Gulstonian Lectures on Dysentery.

liver, with deep jaundice in the one; while in the other the only prominent symptoms were emaciation and debility.

A kidney much puckered externally has been shown, the urinary tubules of which were found by the microscope reduced in size, and filled with fat globules. The Malpighian bodies were also partially filled with fat and enlarged.

A case has been recorded of inflammation and ulceration of the bladder, consequent upon gonorrhœa, in a woman. Purulent matter and blood globules were found in the urine. The patient having died soon after of puerperal peritonitis, the mucous membrane was found granular and with cicatrized marks.

A very large cancerous tumour, which was firmly attached to the spine, and seemed to have originated from some part in the lumbar region, has been exhibited. Irregular rounded bodies were felt in the abdomen, which was greatly enlarged; there was also constipation and pain, with some œdema of the right thigh. The rounded bodies were found to consist of enlarged mesenteric glands, many of which were involved in the disease, and the tumour itself was soft and of a yellowish-white colour. When examined with the microscope, it was found almost entirely made up of cells, which had the characters usually seen in encephaloid disease.

A scirrhus tumour of the breast has been brought under our notice, where the removal was performed under the influence of ether.

A singular case of cancer of the uterus has been laid before us, where two forms of this disease were present. The whole of the organ was greatly enlarged, and the body consisted of a soft pulpy mass, seated between the muscular fibres and mucous membrane, of a whitish colour and encephaloid character, while the cervix was dense, of a hard fibrous structure, and separated from the other by a distinct septum. Under the microscope the encephaloid mass was found to consist chiefly of irregular caudate cells, with traces of fibrous structure. The scirrhus portion exhibited a dense fibrous structure with few cells.

A large and characteristic specimen of fibrous tumour of the uterus has been exhibited. Indications of the disease were present for seven years, and the patient sunk under the severity of the pain, and repeated attacks of flooding at the age of forty-six. When examined with the microscope, no cell development could be seen; the diseased mass, consisting of fibres, arranged in bundles, and parallel to each other, with others intersecting them at various angles. There were also some granules interspersed, some of which were aggregated into separate bodies.

We have examined a cauliflower excrescence which was removed from the *os uteri*. The hemorrhage after the operation was moderate, and easily restrained by plugging, and the woman speedily recovered.

We have to record an unfortunate case, where a slight operation was performed for the purpose of removing a state of almost complete occlusion of the vagina. A probe could with difficulty be introduced along a passage, through which, as well as by the rectum, some drops of catamenial fluid escaped at monthly periods, attended with paroxysms of such severe pain, that on one occasion the patient was actively treated for peritonitis. Under these circumstances, and after she had suffered from hæmatemesis, the opening was enlarged by cutting the walls of the vagina on each side, so as to admit the little finger. No bad symptom occurred until the seventh day, when peritonitis set in and carried off the patient in four days. Though no part beyond the vagina was wounded, inflammation was found to have extended to the cavity of the uterus and to the peritonæum. While this case gives us a salutary lesson as to caution in such operations, it should be observed that erysipelas was in the hospital at the time.

A case has been mentioned where violent pains were experienced in the back and breasts at monthly periods, but where no operation could be performed, as the upper part of the vagina seemed entirely wanting. In a case of imperforate hymen rather alarming symptoms of peritoneal inflammation supervened some days after division of the membrane, and evacuation of an enormous quantity of accumulated catamenial secretion.

A case of gangrene of the *labia pudendi* after measles, in a child 3 years of age, has been shown. It occurred at the Kirkdale industrial schools, where two similar cases have lately been observed.

A highly interesting case of successful operation from ovarian dropsy has been fully detailed to us. An incision having been made into the tumour and its contents evacuated, suppuration from the sac was established by the introduction of a tent, and the wound gradually contracted to a sinus the size of a quill. Many of us were disposed to attribute the success of this operation to the circumstance of adhesion having taken place between the sac and the walls of the abdomen. The fortunate termination, however, of a second case, which has since been operated upon by the same gentleman, where there was no adhesion, would seem to show that this condition is not essential. This mode of removing ovarian dropsy would therefore appear well worthy of the favourable consideration of operating surgeons.\*

# 1. *Apoplexy from Aneurism of a branch of the Basilar Artery.*

By Dr CARSON.

Dr Carson presented to the society, on the part of Dr Dickenson, the preparation of an aneurismal tumour of the posterior cerebral artery.

\* It is much to be regretted, that, since this was written, the second case alluded to has terminated fatally five weeks after the operation from *peritonitis*.

The patient, aged 34, had been a hard drinker. He was admitted 11 weeks previous to his death into the Workhouse Hospital, under Dr Carson. He had been affected for five or six months with cough, had never spit blood, but had lost flesh considerably. A few days previous to his entry his feet began to swell, and he had a pale puffy œdematous character of the whole body. Although the urine, examined several times during the course of the disease, was not albuminous, he was considered by Dr Carson to labour under Bright's disease, and treated accordingly with hydragogue aperients, &c., and which kept down the œdema. He continued much in the same condition, losing flesh, however, until the 11th January, at which time he was under care of Dr Dickenson, when he was discovered by one of the patients in the ward in a fit, in which, however, he did not long remain. A blister was applied to the nape of the neck, and a calomel purgative was administered. On the following day he complained of pain in the back, and it was observed that the muscles of the left side of the face were paralysed; there was ptosis of left eyelid, and the pupil was dilated widely, not contracting under the influence of a bright light, but the vision was not affected. Sensation of the paralysed side was not affected. No paralysis in any other part of the body. He felt pain in forehead; pulse full and firm. Sixteen ounces of blood were drawn from the arm, and a purgative was administered. He continued in much the same state as to the paralysis to the last. A peculiar state of excitement came on. He was continually talking, but always to the point; slept little; passed his motions in bed, but would occasionally call for the pan. He gradually sunk, and expired twenty-three days after the fit, the excitement remaining to the last, though the intelligence was in other respects unaffected. There was a slight improvement in the power of raising the eyelid.

Permission being obtained to open the head, there was found a considerable effusion of bloody serum at base of the brain. In the depression between the optic commissure and the *pons Varolii* was a pretty tough fibrinous coagulum, extending into the fissure between the cerebrum and cerebellum towards the left side. The pressure of this clot upon the optic nerve, the third pair, and the *portio dura* of the seventh, explained the paralysis of the iris, the ptosis, and the paralysis of the left side of face. On laying open the basilar artery, and the arteries going off from it, there was found on the posterior and inferior cerebral artery an aneurismal dilatation about the size of a large pea, whose rupture had been the source of the fibrinous clot, and of the blood effused in the subarachnoid cellular membrane.

2. *Tumour within the Cavity of the Orbit producing Amaurosis and Exophthalmos.* By R. HIBBERT TAYLOR, M. D.

A girl, aged 22, was sent to me by another practitioner in Sep-

tember 1841, on account of defective vision of one eye. She was rather below the middle size, of lymphatico-nervous temperament, and a strumous unhealthy appearance. With the *right* eye she was able to read a small type easily, but with the *left* merely distinguished light and shadow, and that imperfectly. Both pupils were regular in figure, and of medium size; the *right* contracted freely on exposure to light, and the *left* partook of its movements; but when the former was covered from the light, the latter became fixed and slightly irregular. Examined catoptrically the images were natural in both eyes.

The subjective symptoms were as follow. For six months past the patient was subject to general headach of a dull heavy character, accompanied with vertigo and drowsiness. Three months ago vision with the *left* eye was first observed to be cloudy and defective. At first intermitting these symptoms gradually became permanent, and during the last week she has been unable to distinguish any object with this eye. An appearance of mist has also been observed before the *right* eye for a month past. There is no loss of memory, nor any failure of sensation, or voluntary motion. Her general health has always been delicate, and the catamenia are frequently irregular. Says that she had had repeated attacks of inflammation of the chest, and has also been affected with dropsy. The abdomen is at present unusually large and flabby.

Soon after the date of her first visit to me she became subject to severe lancinating pain of the *left* side of the head, and in the eye; it was almost constant, and extended down the corresponding side of the neck to the shoulder. The *left* eye was now insensible even to a strong light. A few months later the headach began to assume a new feature, and arise in a circumscribed spot on the left temple, shooting from thence towards the vertex. Vision with the *right* eye, the only one now available, became obscured with the appearance of a shade darkening the upper half of the field of vision, so that on looking at any object the lower part was more distinctly seen than the upper. When walking in the street the appearance of dark clouds would suddenly descend before her and remain for a few seconds, rendering every thing indistinct; and one evening, while reading by gas light, vision suddenly failed entirely for a minute or two and then returned.

During the greater part of the year 1842, she continued subject to pain of the *left* side of the head, either of a dull heavy character, or else shooting in sudden flashes from the temple to the vertex and occiput, and down the corresponding side of the face and neck to the shoulder. She was seldom entirely free from pain, although its severity was much aggravated during occasional paroxysms.

Towards the end of the year 1842, the *left* eyeball was observed to be slightly protruded from the orbit directly forwards with puffy swelling of the upper eyelid. There was constant dull or shooting pain in the eye and head, accompanied with a sensation as if the eyeball was pushed outwards. In the morning the palpebræ were generally so much swollen as to close up the eye, especially after having passed a restless night; and a severe attack of pain was always followed by puffy swelling of the eyelids, and sometimes of the face and neck on the same side, accompanied with erythematous redness of the surface. The motions of the protruded eyeball were still free and natural.

In the spring of 1844, the protrusion of the globe had still further increased, and on pressing it directly backwards into the orbit, an elastic resistance was felt greater than in the normal condition of the parts. The attacks of pain continued much as before in frequency, character, and locality. A new symptom was, however, superadded in the form of shooting and throbbing pain in both ears, which continued nearly two months, and thereafter a slight yellowish discharge flowed from each meatus, but soon ceased. Vision with the *right* eye still continued tolerably good, so that she was able to make out a small type with a little difficulty.

In April 1845, the prominence of the left eyeball had increased so much that it was almost protruded from the orbit. It was still covered by the palpebræ, although the upper lid could not be raised over the cornea without great risk of allowing the entire globe to pass beyond the margin of the tarsus. About two months previous to the above date, this mishap actually occurred during some convulsive movements of the muscles of the eyeball or lids; the displacement was productive of considerable pain, and the globe was with some little difficulty returned into the orbit. This accident has *twice* happened since; once spontaneously, when the patient was in bed and asleep; she suddenly awoke and found that her eye was out. Being unable to replace it, the globe remained extruded beyond the lids during at least twenty minutes before medical aid could be obtained. Since then she has constantly worn a band of thin muslin passed over the eye and round the head to prevent a like occurrence. On the last occasion, which happened about six months ago, I was present and witnessed the extraordinary spectacle. I had taken her to consult the late Mr Gill of this town, and during this examination of the eye, happening to raise the upper lid over the most prominent part of the cornea, it immediately slipped backwards over the smooth convex surface of the eyeball, exposing the entire globe even to the insertion of the optic nerve. Thus seen in all its dimensions the eyeball presented a perfectly natural and healthy appearance. It was easily replaced by drawing upwards the tarsal margin and pressing back

the globe; but the sudden extrusion caused excessive pain, which lasted for some minutes, and considerable uneasiness was felt during several days afterwards.

During the early part of last summer (1846,) the headach, which had up to that period been chiefly confined to the *left* side of the cranium, began to be felt more generally over the head, and especially in the vertex and occiput. By degrees it extended to the *right* side of the head, where, as formerly on the left, it commenced at a circumscribed spot on the temple shooting back towards the occiput in sudden darts, and down the side of the neck to the shoulder. These symptoms have continued with more or less severity up to the present date, (April 1847.) Soon after the accession of pain to the *right* side of the head, vision with the corresponding eye began to fail, and she is now merely able to distinguish light and shadow. The pupil is of regular figure, but does not contract on exposure to light. The globe still retains its natural position, and can be freely moved in any direction. The protrusion of the *left* eyeball has not increased during the last year and a half; it is almost entirely without the boundaries of the orbit, but its movements still harmonize with those of the other eye. Measured from the internal canthus, over the most prominent part of the globe to the outer commissure of the lids, there is the difference of about one inch in the length of the line between the protruded eye and the other.

The patient's general health has declined considerably during the last two years, the catamenia have not appeared for twelve months, and the constant pain which she suffers seems to have induced a slight degree of mental imbecility.

With regard to treatment, as the case was obscure from the first, and the prognosis unfavourable, active measures have been very sparingly adopted, and the attention has been rather directed to what seemed likely to alleviate the pain and soothe the consequent irritability. Leeches have been occasionally applied to the temples and afforded temporary relief to the headach. Calomel with opium was given in small doses several years ago, and the mouth became rather suddenly affected, attended with great prostration of strength. A seton was also placed in the neck at a later period, and worn during many months. Resource has also been had to homoeopathic treatment, under the direction of a practitioner in this place. But none of these measures appeared to be of more than temporary benefit, and even that was at times very doubtful; the disease has continued steadily to advance, and seems likely to issue in the entire destruction of sight.

Any opinion which I can offer as to the nature of this affection must be in a great measure conjectural, as its history and appearance are both sufficiently ambiguous. It is evident that the left orbit is filled by an adventitious growth, which I presume to be



solid from the firm resistance which is felt on pressing the protruded eyeball back upon it. The elastic sensation conveyed to the head at an earlier period of the disease, or making pressure into the orbit, suggested the possibility of a cyst having been developed in the cavity, but the increased firmness of the growth seems now to preclude this idea. I have repeatedly thought of making an exploratory puncture deep into the orbit behind the eyeball, but have hitherto been deterred, from the absence of fluctuation and the fear of only aggravating the severe symptoms of an unknown disease. The general appearance of the patient, and the lancinating character of the pain are favourable to the supposition of a malignant growth. But, on the other hand, the extreme slowness of its progress, even when the symptoms were acute, and the cessation of pain in the left eye and side of the head, and its transference to the right, seem to indicate that the affection is not of this nature. Were I to hazard an opinion upon the subject, judging from the somewhat ambiguous analogy of other cases, the details of which have been published, I would say that the growth which fills the left orbit is probably of a scrofulous character, and is connected with the optic nerve. The stretching and disorganization of this structure would sufficiently account for the pain and blindness, while the development of the tumour in and around the substance of the nerve may suffice to explain why the eyeball is pushed so directly forward, instead of being diverted from its natural direction, as usually happens in the case of morbid growths within the cavity of the orbit. The symptoms which are now experienced in the right eye are precisely those which marked the invasion of the disease in the left, and if the patient's life is sufficiently prolonged, there is only too much reason to fear that they will issue in a similar result.

### *3. Peculiar form of Ulceration of the Palpebrae.* By R.

HIBBERT TAYLOR, M. D.

THE following remarks are intended to illustrate a form of disease which must be comparatively rare, as out of nearly 11,000 cases of affections of the eye which have passed through my hands during the last few years, I have only met with three examples. They all occurred in persons of enfeebled health, and in each the tarsus of the upper eyelid towards its inner angle was the seat of the disease. Two of the cases occurred in women, the third in a man.

The specimen from which the drawing now exhibited was taken occurred in the person of a delicate-looking woman, who came to my Dispensary in the course of last summer, (1846). The disease had been of some standing, and commenced by a small pimple upon the margin of the tarsus; this she scratched, and it gradually inflamed and ulcerated. When I saw her the

sore was equal in size to the surface of a split pea, somewhat irregularly oval in figure, with an uneven base and sharp excavated edges. Its general appearance was very much that of a chancre, but it had no hardened base, nor was there any of the thickening and hardness round it which is observed in cancerous sores. The surrounding integument was very slightly reddened, and there was no pain. The appearance of the parts seemed rather to betoken deficiency of action than undue irritability. There was a small tubercle seated in the substance of the tarsus close to the outer edge of the ulcer.

Before noticing the treatment adopted, I shall briefly describe another case of a similar character, which occurred to me some years ago, because the true nature of the disease was more distinctly marked in that instance, and by the experience gained in its treatment, I was chiefly guided in the choice of remedies for the second example.

It occurred in a man, aged 25–30, of strumous and cachectic appearance. The ulceration occupied nearly the same situation upon the eyelid as in the first case, and was in appearance very similar. My first impression on examining this sore was that it was a chancre. The patient, however, stoutly denied having had either gonorrhoea or syphilis, or that he had taken mercury, and certainly he did not exhibit any other suspicious symptom. On inspecting his gums, I discovered upon the outside of the upper jaw another ulcer exactly similar in appearance to that seated upon the upper eyelid. Judging from the general appearance of the patient, in whom the strumous diathesis was strongly marked, and the indolent character of the sores, I concluded that they were of scrofulous origin, and resolved to treat them accordingly.

As a local application, I touched the ulcerated surface with the solid nitrate of silver, and gave him a slightly stimulating collyrium to use in the intervals. As general treatment applicable to the enfeebled state of the system, he took a vegetable tonic, either quinine or calumba, and a nutritious diet was recommended, but whether or no adopted I cannot say. However, in the course of a few weeks his general health improved very much, and the sores healed entirely.

And now to return to the case first mentioned; a similar plan of treatment was adopted in it. The local stimulus did not, however, appear to do good but harm, inducing irritability of the ulcer, and a disposition to spread rather than to cicatrize; it was therefore omitted, and a slightly astringent wash substituted in its place. As a tonic, calumba, combined with a little soda and rhubarb, was given. In the course of a fortnight the sore had assumed a more healthy appearance, although it was not much diminished in size. Shortly after this the woman went

into Wales, and I have not seen her since ; but I learned from a person with whom she lodged in this town that the ulcer healed completely.

The third example of this form of ulceration was observed in the eyelid of an old and much debilitated woman, who with difficulty crawled to my Dispensary during the very hot weather of last summer. She was evidently sinking under the effects of some internal chronic disease ; and died in a day or two after I first saw her.

The ulceration occupied the same position on the internal angle of the right upper eyelid, as noticed in the former cases, but it differed somewhat in appearance, being of smaller diameter, nearly circular at the margin, and had a deep funnel-shaped base. The patient described it as having commenced, like the others, with a small pimple ; and during the short time that I had an opportunity of observing it, the ulcer did not enlarge in diameter, although it seemed to become deeper.

The result of the treatment in two of the above cases seems sufficiently to indicate the true character of the disease, while it removes any doubt which the suspicious appearance of the sores naturally tended to awaken. Ulceration attacking the edges of the eyelids is not a very unfrequent occurrence in aggravated cases of strumous inflammation of the tarsus ; but in such instances it is usually superficial, and spreads along the border of the lids, especially of the upper, at the roots of the cilia. The form of disease above described is not noticed by any of the best writers upon ophthalmic medicine which I have consulted, although it is not likely to have escaped their notice. I am induced, therefore, to regard it as somewhat peculiar, and not unworthy of remark, especially from its outward resemblance to other and more serious affections with which at first sight it might easily be confounded.

*4. Dilated Bronchi and Hypertrophy of the Heart following Pleurisy with Contraction ; Emphysema ; Dilatation of Pulmonary Artery.* By JAMES TURNBULL, M. D.

Lawrence Kinsella, a seaman, aged 36, was admitted into the Northern Hospital on the 23d December. About sixteen months before he got a severe cough and cold, from which he recovered in three weeks, but the cough never entirely left him, and his breath continued short. He never had hæmoptysis, night sweats, or diarrhœa. On admission there was much dyspnœa, lividity of the lips, and puffy swelling of the face. There was debility, but not much loss of flesh.

*Physical signs.*—On the left side there was deficient expansion, and below the clavicle considerable depression. The sound on percussion on the same side was more or less dull everywhere,

but especially at the lower part. In the left interscapular and the scapular regions it had a hollow amphoric character. Strong vibration was communicated to the hand by the voice and the cough in these situations, and there was very distinct cavernous respiration with pectoriloquy and cavernous cough. Below the clavicle respiration was blowing, and at the lower parts of the chest it was suppressed. On the right side there were sibilant rales and clearness on percussion. The impulse of the heart was increased in strength, and the sounds were extensively heard. The first was dull and prolonged. In addition to the pulsation at the apex, there was also pulsation above the base, about the level of the second rib. In the same spot the first sound was very loud and abnormal, but without a distinct bellows murmur. Five grains of blue pill were given at night, and an aperient draught the following morning. He took also occasionally a teaspoonful of the following mixture.

R. *Oxymel. Scilla*, ʒj ; *Tinct. Digitalis*, ʒii ; *Tinct. Camph.* co. ʒj ; *Acid. Hydrocyanici dil.* ʒss.

On the 26th he was better, the dyspnoea and oppression having been relieved by the mixture. The tongue was still coated though the bowels had been opened. The pulse was 106, not full.

On the 28th the patient was worse ; there was great dyspnoea, and the pulse was 120 full. A mixture containing sulphuric ether was given, which gave him much relief.

On the 31st, however, he died.

*Inspection.*—There were old adhesions of the right pleura. The lung was very emphysematous, and its vessels much congested. The left lung was almost completely obliterated by old fibrous adhesions, which bound it close to the vertebral column. The bronchial tubes were dilated, and the circular muscular fibres were very distinct. The heart was much enlarged, and completely rounded at the apex. All the cavities, but especially the left ventricle, were enlarged, and the walls were much thickened. All the valves were healthy. There was dilatation of the pulmonary artery.

*Remarks.*—We can easily trace the complication of disease in this case to an attack of pleurisy of the left side with effusion. Along with this there had been deposition of false membrane upon the surface of the lung, which must have become organized before absorption of the fluid, and thus have prevented the lung from ever again expanding. We trace the dilatation of the bronchial tubes to the expanding power acting entirely upon them instead of the pulmonary tissue. And we see a sufficient reason for the enlargement of the heart, especially the right side, in the destruction of one lung, and the emphysematous condition of the other, while we account for the congestion of the vessels, and the dilatation of the pulmonary artery from the increased power of

the heart on the one side, and the obstruction to the pulmonary circulation on the other.

The case is chiefly interesting in reference to diagnosis. As regarded the heart, the signs were sufficiently well marked to indicate clearly its enlarged condition, but they did not furnish equally exact indications of the state of the lungs. Dr Addison has lately, in a paper published in Guy's Hospital Reports, shown that in such cases as this we are in danger of falling into error if we trust exclusively to stethoscopic signs and overlook the general symptoms. It is, however, by combining not merely these two methods of investigation, but also along with both a knowledge of the pathological effects of disease of one organ upon others more or less connected, that we can hope to make a correct diagnosis. Observing the absence of hæmoptysis, emaciation, night sweats, and diarrhoea, I was led to suspect bronchial dilatation, though from the marked cavernous character of the respiration, the cough, and the voice, I was more inclined to regard the case as one of chronic pleurisy terminating in tubercular deposition and the formation of cavities.

##### *5. Obliteration of the Descending Vena Cava from Cancer of the Lung.* By JAMES CARSON, M. B.

Dr Carson presented to the society the viscera of the cavity of the chest of a patient who had died in the Liverpool Workhouse Hospital. The man, aged about 45, had been discharged from the ward cured, after a severe attack of the epidemic dysentery, six weeks before his readmission, affected with the complaint of which he died.

On his re-entry he laboured under the symptoms of bronchitis, and presented, on examination by the stethoscope, the characteristic rhonchi. Two days after, his face and neck appeared swollen, and as it had also a reddish appearance it was suspected that erysipelas of the head and face was about to commence. As, however, the œdematous appearance of the face might be occasioned by disease of the kidneys, the urine was examined, but was found natural, not coagulable by either heat or nitric acid. An aperient was administered (*Pulv. Jalap C.*), and a weak spirit lotion was applied to the face. On the following day, after a free evacuation of the bowels, the swelling was diminished and the erythematous appearance had altogether disappeared. Dr Carson being out of town did not see the patient for a week after this. On his return he was struck with the remarkably swollen appearance of the face and neck. He was, in consequence, induced to examine the rest of the body, and found that the œdema extended over the whole of the anterior wall of the chest to the epigastrium, and on each side to the false ribs, but did not exist in any other part of the body. On the sides of the chest where the œdema began to

disappear, there were several clusters of dilated and contorted veins, and there were on the fore part several livid patches, which, examined closely, were found to be occasioned by networks of minute veins dilated. The external jugular and the facial veins were also dilated. The veins of the arm were at all times full, but not to distension, and there was at no time any œdema of the hands or arms. The œdema of the chest, fore part of the neck, and face, was very deep. The man complained of a sensation of choking. The bronchial rhonchi were still heard; the sounds of the heart and their rhythm were natural. There was some degree of dulness on percussion on the right upper part of the chest, but on account of the great œdema of the walls, the indications from this mode of investigation were very obscure. The diagnosis was obstruction, total or partial, of the descending cava; and the prognosis was doubtful, as depending upon the nature of the cause of the obstruction. The course of the aorta in the thorax before and behind was carefully examined, for the indications of the presence of an aneurism, which has in most cases been the cause of the obstruction of the descending cava, but no evidence of any such disease presented itself. The only relief, and that was in degree, to the symptoms, was derived from the use of hydragogue purgatives and diuretics. The sense of tightness in the throat became gradually more oppressive, the cough continued violent all through the disease, and there was considerable bronchial expectoration. On account of his transfer to the charge of the Fever Hospital, Dr Carson had, at the latter part of the disease, the patient less constantly under his observation; but he was informed by the house-surgeon, Mr Watkins, that latterly the dulness on percussion on the right side was more marked; that the sense of choking, amounting to an inability to swallow a considerable morsel, increased; and, that for two or three days before the death of the patient, dyspnœa and oppression at the chest were very prominent, though the patient at no time complained of pain. On making a *post mortem* examination, and removing the anterior wall of the chest, the right lung was found strongly adherent by a false membrane, apparently of old formation, to it. The left lung was perfectly crepitating all through, and was, with the exception of the presence of bronchial congestion, perfectly healthy. There was, however, considerable serous effusion into the right cavity of the pleura. The whole of the contents of the chest were carefully removed. The right lung was found adherent in every part to the walls, and at the root these adhesions were so strong, as to be with great difficulty separated. On opening into the cavity of the pericardium, it was found distended by a sanguinolent gelatiniform fluid, in which floated flakes of recent lymph, and the whole of its serous membrane

was covered by a thick fibrous membrane, rough externally like a neat's tongue. The right lung was united to the *pleura costalis* by a false membrane, which became gradually more dense as it approached the root of the lung, where it became continuous with a scirrhus mass penetrating round the tubes and vessels into the substance of the lung. From this mass an offshoot extended upwards and to the left, over the side of the spinal column, and compressed the descending *vena cava*, between its junction with the innominate and the azygos vein, which was traced downwards along the right side of the spine, dilated to the thickness of the little finger. On opening into the right auricle of the heart, and slitting up the descending cava to the point where it was compressed by the tumour, the vessel was found to be pervious, but the sides were kept by the pressure of the tumour so completely in apposition, that it was quite impossible that any blood could pass through it. In evidence of this, there was found a fibrinous clot, dilated into a bulb above and below the point of pressure. The lining membrane of the vein was rather dark coloured at this point, but there were no indications of phlebitis. It was obvious, from the anatomical disposition of the parts thus described, that all the venous blood of the body returned to the heart by the ascending cava and the azygos vein through the lower portion of the descending cava. The tumour was of a decidedly malignant character, more scirrhus at the root of the lung, but encephaloid in the process, described as passing upwards and to the left, and compressing the cava. There were in the substance of the middle lobe of this lung numberless small patches resembling tubercular deposits. These and the substance of the tumour, in every part examined by Mr Padley, presented under the microscope all the histological characters by which cancer and its various forms is distinguished. This lung in other respects resembled the left.

Dr Carson took the opportunity of introducing to the society the individual of whose case a short analysis had been published in the report of the meeting of the Newton branch of the Provincial Medical and Surgical Association, published in the Provincial Medical Journal. The man at this time, two years after the commencement of the disease, was in robust health, and in active employment as a daily labourer in a soap manufactory. He suffered no inconvenience, except from a sense of fulness in the head and throat when he stooped to his work; and when he bent down to illustrate this, his face assumed an obviously flushed and congested appearance. The veins in the neck and forehead being tense and dilated. The anterior part and sides of the chest and abdomen were covered with a net-work of large dilated and tortuous veins, from the thickness of a swan's to that of a goose's quill. The tortuosity was more remarkable at the epigastrium, between which

and umbilicus was a mass resembling a medusa's head. The course of the blood in these veins was obviously from above downwards. In this case, which was diagnosed as a case of obliteration of the cava between the right auricle and azygos vein, there was the marked difference between it and the one just described, that the oedema was not confined to the anterior parts of the head, neck, and chest, and that it also extended to the arms. It would appear that the *vena azygos*, receiving the blood from the intercostals, into which, by indirect and in some instances retrograde courses, the whole of the venous blood from the arms and posterior parts of the head, neck, and chest, flowed, was in its dilated condition a sufficient drain for the venous blood of these parts.

Dr Carson, in the case first described, quoted two other cases which had fallen under his observation of local dropsies, caused by obliteration of a principal vein. In the one, which occurred several years ago in the Northern Hospital, in an old man, who died of chronic bronchitis, a local oedema, limited to a space which could be covered by the hand spread out, on the upper middle and anterior part of the chest, was occasioned by the complete obliteration of the mammary vein before it enters into the left branch of the innominate by a small aneurismal tumour springing from the arch of the aorta, which was not discovered during life, and to the detection of which the very great thickness of parts caused by the oedema was an insurmountable obstacle. The second case was one in which oedema of the left side of the face, head, and neck, and of the left arm, was caused by obliteration over a considerable extent of its length of the right branch of the innominate, by an enormous aneurismal tumor of the ascending aorta. In this case the patient was carried off by a pleuritis and pericarditis of precisely the same character as the pericarditis of the patient whose case is described at length. Dr Carson referred for the history of the obliteration of veins and of their effects to Drs Reid and Thomson's cases in the Edinburgh Medical and Surgical Journal, M. Reynaud's papers on the obliteration of veins in the Journal Hebdomadaire, to Cruveilhier's Pathological Anatomy, and to Mr Peacock's case published in the Medico-Chirurgical Transactions, appended to which last there is a good bibliography of all that has been written and said upon this subject. In addition to these a very interesting case of obliteration of the *vena cava* from phlebitis has been recently published by Dr Black of Manchester. Dr Carson stated his opinion, which he believed to be that of Reynaud's, that the presence of dilated veins and the oedema consequent upon them, often affords a good diagnostic indication of the presence of deep seated tumours or congestions in the large cavities of the body.

Dr Carson also communicated the following case of



6. *Cancer of the Neck and Right Lung, with Obstruction of the Right Subclavian Vein.* By Dr Black of Manchester.

Mary M'Williams, aged 43, had been in the hospital for three months, afflicted with general cachexy, cough, dyspnœa, and recurrent bloody expectoration, with weak appetite. Six weeks before her death a firm inelastic swelling appeared above the right clavicle, as if emerging out of the chest in the line of the cervical column. It was hot, reddish, and painful; the hæmoptoe increased, and the dyspnœa became greater, with a good deal of general fever. In a few days the tumour became more distinct, and the tegumental veins of the neck, right shoulder, and right breast became turgid, swelled in size, and extensively anastomosed. The right side of the face was also affected with much œdema, and deglutition was very difficult.

Hæmoptoe at length ceased, the tumour greatly subsided, and deglutition became easy. After a week's further suffering from dyspnœa and much pain she died in a quiet manner on the 28th January 1847.

*Inspection.*—Body warm, and not greatly emaciated. Ribs adherent on the right side throughout to the lung, which was densely hypertrophied, and half filled with cancerous tubera, opaline, white, and many of them contained depots of creamy gelatiniform matter. There was also grey hepatization, but no pus nor tubercles. Left lung crepitous and somewhat emphysematous.

Heart large, but normal in its parts. A large scirrhus mass the size of two fists occupied the upper aperture of the right side of the thorax, firmly adherent to the corresponding side of the cervical spine, and enfolding all around the arch of the aorta. The right subclavian vein near its root was plugged up by fibrinous coagula, besides being compressed by the tumour.

Liver large, dark coloured, and hyperæmiated.

Kidneys natural, but of unequal size.

7. *Case of Adhesive Phlebitis.*—By T. INMAN, Esq. M. D.

A. B. aged 40, admitted into the sick wards of the Liverpool workhouse, with œdema of the left leg and thigh. He had originally been a sailor, but had been an inmate of the establishment for some years previous to his present attack. Two years ago he had had something the matter at the groin, the real nature of which I could not make out. From that time to his admission under my care he had been quite well; had lived, of course, a temperate and regular life, and had not suffered from any atmospheric vicissitudes, or other accidents.

When I first saw him, the leg was simply œdematous, having precisely the same appearance as in anasarca; the other extremi-

ties were unaffected, and his general health unimpaired. On examining the left iliac fossa, I found, considerable dulness on percussion and tenderness on pressure, and on examining the groin, I observed that the femoral artery was pulsating more strongly on this side than the other. There was no tenderness, however, at this spot, or along the course of the vessels down the thigh. Considering the case as one of incipient tumour, or abscess in the pelvis, I merely ordered rest in bed and the constant use of a flannel roller. Under this treatment the limb was soon reduced in size, but never recovered its natural character, as it always pitted upon pressure and looked anasarcaous.

Not long after his admission, a tumour made its appearance half-way down the inside of the thigh, but disappeared again under the use of fomentations and poultices. Some weeks after this, the opposite leg and thigh began simultaneously to swell, and soon presented the same appearance as the first. Subsequently the œdema of this side entirely disappeared, the tenderness left the other groin, the dulness on percussion was no longer observed, and the man seemed to be in a fair way of recovery. In spite, however, of these favourable symptoms, he was evidently getting weaker; his appetite left him; his nights were sleepless; he felt ill, and seemed to be under the firm belief that his complaint was mortal. Quinine, iron wine, and other invigorating agents produced no effect. Emaciation advanced rapidly; diarrhœa ultimately set in, and in a short time carried him off. He was in all under treatment for many months, during which time (with the exception of the swelled legs) he had no decided symptoms of disease.

The diagnosis was necessarily very vague. A tumour or abscess was supposed to exist, producing pressure upon the iliac veins. The idea of phlebitis was never entertained by me, or any of my colleagues, in consequence of the absence of "brawiness" in the limb, and the want of the supposed characteristic signs, of tenderness on pressure, and the cord-like feeling of the veins of the limb.

*Inspection.* — Body considerably emaciated; the right foot and the left lower extremity slightly œdematous. On examining the pelvis, the femoral and iliac veins on both sides appeared like solid cords of considerable size. On slitting these open, it was seen that the appearance was due, partly to the increased thickness of their proper tunics and their cellular investment, and partly to coagula of whitish fibrine with which they were filled. On tracing this diseased condition upwards, it was found to extend about two inches up the *vena cava*, where it abruptly terminated. On tracing it downwards, it was met with as low as the middle of the thigh on the right side, and the popliteal space on the left, beyond which it was not sought for. The veins in the

diseased parts were so completely filled up that a probe could be passed with the greatest difficulty through any of them. The coagula with which they were filled had evidently been produced by secretion from the inner membrane; from which they could not be removed without great force, and were intermixed here and there, with thin but strong bands of a fibrous-looking tissue, which stretched from side to side of the vessel, making strong partitions across it of considerable length. Every vein in the pelvis that could be examined presented the same appearance, and it was impossible to find any way in which the returning current from the lower extremities could have passed.

The arteries were very small, and as usual quite empty.

The heart, liver, lungs, intestinal canal, and kidneys were all healthy.

The foregoing case is especially interesting to the pathologist, in showing the great amount of disease which may exist in an important organ, without giving rise to any remarkable general symptoms; and to the physiologist, as affording proof of the power of nature to accommodate herself to new conditions and altered circumstances.

It may be thought that the acute stage of the phlebitis had passed over before the man came under my care, and that it was then only in a chronic stage, during which pain and tenderness were not essential. But though we presume that these may have existed, the patient was never conscious of their presence, and certainly when first seen, could bear the strongest pressure in every part, except over the left iliac fossa, to which the tenderness was confined, and from which it soon disappeared. I think it, however, far more probable, that the disease never had an acute stage, but was one of a class with which we occasionally meet, in which a low kind of inflammation goes on for a length of time unnoticed and unheeded, until the effects it has produced are too evident to be passed by. How else can we explain the remarkable difference between the few symptoms in this instance, where such an enormous amount of disease existed, and the formidable ones we meet with in other instances of adhesive phlebitis, where a much smaller portion probably is implicated? In the former, nature had time to adapt herself to the new circumstances under which she found herself, and diminished the amount of the forward current as the returning channels became obstructed. In other cases, however, where the inflammation is acute and the obstruction sudden, the onward current receives no check, and a condition of distension is produced, which gives rise to most serious consequences.

It will naturally be asked, if the veins both of the thigh and pelvis were choked up, in what way could the circulation be car-

ried on? This question I must confess myself unable satisfactorily to answer. The cutaneous veins were none of them enlarged; they were not even visible under the skin, and could not, therefore, have been the active agents. The lymphatics are out of the question. The nature of the arterial action forbids us to think of them. We are driven, therefore, to the only other plausible supposition, that the whole of the return current must have been carried on by the capillaries of the skin and cellular tissue below it.

A preparation of the veins, from the *vena cava* to the femoral, exists in the museum of the Medical Institution of Liverpool, where it can be seen by any person who is interested in the case.

**8. Cases of Scurvy and Purpura.** By JAMES TURNBULL, M. D.

Case 1. Costar, a sailor, about 25 years of age, a native of Gibraltar, was admitted into the Northern Hospital on the 23d of December in a state of extreme weakness, much emaciated, and with the mouth affected with mercury. This had been given to him on his voyage home from Calcutta; the pains in the limbs and spots having been regarded as syphilitic. The whole surface had the peculiar tawny yellow appearance which the skin often assumes in scurvy. There were many small purple spots on the legs, and some hard swellings, which were painful on pressure, on both tibiæ, especially the left. The gums were sore, and the breath had the mercurial fætor. The patient was treated with lemon juice, nourishing diet, and wine. He gradually, however, got weaker, and died on the 1st of January.

*Inspection.*—The stomach, bowels, and kidneys, were very pale and bloodless. The lungs were anteriorly almost white. The heart appeared healthy, and its cavities contained abundant fibrinous concretions. The liver and spleen were large, and the latter presented two white spots on the surface of the right lobe, on cutting which the knife grated upon a cretaceous tubercle. On examining the node upon the left tibia it was found that blood had been effused into the cellular tissue beneath the skin, and between the muscles. A considerable portion of the periosteum was also separated from the tibia by a clot of blood, but the bone itself was healthy. Similar appearances were seen in the other leg.

Case 2. John Ford, aged 64, was admitted into the Northern Hospital on his return from Calcutta. On the voyage out he was wrecked in the Bay of Bengal, and suffered great hardships. He returned in a vessel with fifteen other seamen, two of whom had also scurvy slightly, and he became ill six weeks before landing. He had a very infirm aged appearance. His pulse was very feeble, and he complained much of feeling cold and weak. The skin had the usual discoloured yellow appearance, and there were purple

spots upon the legs, and a few upon the abdomen and hands. The gums were very sore, and in a state of suppuration. There was no appetite. The bowels were regular. He was treated with lemon juice, vegetables, fresh meat, and six ounces of wine daily; but he survived only a few days.

*Inspection.*—On cutting down upon a swelling over the left tibia, coagulated blood was found effused into the cellular tissue and between the muscles, but there was none beneath the periosteum. There was some sanguinolent serum in both pleuræ, and slight adhesions, which did not seem very old. The lungs were healthy, but there were some reddish purple spots on the pleura covering them. The heart and pericardium were healthy, and the latter contained a small quantity of clear serum. The blood in the vessels and cavities of the heart was not coagulated. The coats of the stomach seemed thinner than natural, and towards the pylorus there was a purple redness of the mucous membrane. In this situation several of the follicles were enlarged and ulcerated. The small intestines were pale and healthy, except towards the lower end of the ileum, where there was a slight purple redness. The whole of the large intestine had a remarkable purple black appearance, both externally and internally, and seemed thickened as if from blood being effused between the coats. The mucous membrane seemed healthy. The contents were of a brownish colour. The liver was healthy, and the gall bladder full of bile. The spleen was small, and of a deep red colour, with white spots, which gave it a porphoritic appearance externally. The gums were purple, and the soft parts easily detached from the teeth and bones, the periosteum also separating. On removing the integuments of the cranium some red patches, arising from extravasation of blood beneath the periosteum, were visible. There was some opacity of the arachnoid, covering the convolutions; and on each side of the falx the *dura mater* adhered to the arachnoid and *pia mater* apparently from old inflammation. There was more than the ordinary quantity of serum at the base of the brain, and it was tinged red.

*Remarks.*—The number of cases of scurvy admitted into the Northern Hospital during the year 1846 was fourteen, and of these two, those now reported, proved fatal. Many were brought in a state of extreme weakness; and it was surprising to see the rapid manner in which most of them recovered when treated simply with lemon juice and nourishing diet, consisting of fresh meat and such vegetables as potatoes and cabbages.

Effusions of blood into the cellular tissue and beneath the periosteum are appearances which have been commonly noticed where this disease has proved fatal. Serous effusions have also been frequently found, especially within the pleural cavities. Ulceration of

the follicles of the stomach, and the purple appearance of the large intestines, do not, however, seem to have been so commonly met with. Dr Budd relates a case where Peyer's glands in the small intestines were dark and conspicuous, and where there were superficial ulcerations of the large intestines. Lind mentions the case of a youth who died suddenly of scurvy, and in whom the bowels were found corrupted. It is not improbable that he thus alludes to a purple blackened appearance such as was found in the second case.

### 3d Case of *Purpura Hæmorrhagica*.

A very stout seaman, about 28 years of age, was admitted into the Northern Hospital on the 4th of June 1846, with a purple red eruption, which began to appear four days previously. More than three weeks before he had syphilis, and was treated with mercury, which affected his mouth. To this he attributed his illness, though the soreness of the mouth had entirely gone off. He had been employed steering the vessel (which sailed usually between this port and the coast of Ireland), during the very hot weather. On the 5th of June I found his face of a purple black colour, and so much swelled that the eyes were completely closed. It appeared as if it had been very much bruised, and the ears were smeared with blood which had flowed from them. During the night he had lost a large quantity of blood from the nostrils, and blood was still distilling from them abundantly. It was rather florid, and the coagulum pretty firm. When examined with the microscope the globules were found serrated at the circumference, and the nuclei as if broken up.

The whole surface of the body was of a deep scarlet purple colour, which was not affected by pressure. The legs and ankles had the deepest colour. The hands and feet were swelled like the face, and the palms and soles were of a purple black colour. The skin was rather hot; the pulse 108, weak, but rather sharp. The tongue was clean so far as it could be seen. The bowels had been opened by Epsom salts. I immediately prescribed a draught with *Ol. Terebinth.* ʒss.; and a solution of gallic acid was injected into the nostrils, and stopped the bleeding. Lemon juice was ordered for him, also calomel gr. v., one hour after which the following draught was taken.

*R. Ol. Terebinth.* ; *Ol. Ricini* aa. ʒiv. ; *Mist. Acaciæ* ʒiv. ;  
*Aquæ Menth. pip.* ʒi.

On the 6th the patient felt weak. The pulse was 130, and weak. The face, though less swelled, had still an œdematous congested appearance, as well as the hands and feet. There had been some hemorrhage from the ears, and there was ecchymosis of the conjunctiva of both eyes, especially the left. The gums and palate

were of a purple colour and swelled. The patient stated that his gums had got well from the mercury, but had again felt sore for two days. There was no mercurial fetor. The patient had been thirsty and had taken the lemonade freely. There was some tenderness of the epigastrium on pressure, but no hepatic fulness. The bowels had been opened three times, and the motions were black. Four grains of calomel with four of the compound extract of colocynth were given immediately, and the same draught was repeated in the afternoon.

On the 7th he seemed rather better. There had been slight hemorrhage from the mouth, eyes, and ears, and there was an abundant flow of saliva, but without any mercurial fetor. The swelling of the face and purple appearance had diminished, and the purple redness of the arms was fading. He complained less of debility, and the pulse had fallen to 116. The tongue was clean, but the appetite bad; the bowels had been opened twice, but not until the morning; the motions were not so dark. The draught was again given, and a mixture with diluted sulphuric acid and infusion of roses.

On the 9th there was little change, except that the breath had become very offensive; the colour of the skin was fading, and the cuticle separating in some places. The pulse was 110. Two grains of quinine were added to each dose of the acid mixture, and the draught with castor-oil and turpentine was repeated.

On the 12th he seemed better; the swelling and purple appearance of the face had disappeared. The scarlet-purple colour of the skin had nearly disappeared, and the cuticle was separating. The breath, however, was very fetid, and the whole body had an offensive odour. The pulse was 100. He had spat up a considerable quantity of blood.

He was much worse on the following day, having continued to spit blood, and it also exuded from the cracks in the hands where the cuticle had separated. The pulse was 150, very feeble. Wine was administered, but he died the same day.

*Inspection.*—The right pleura contained eight or ten ounces, and the left about six of sanguinolent serum. On the left side there were some long adhesions, with traces posteriorly of more recent inflammation. The lungs were healthy, but very pale. The pericardium contained a moderate quantity of serum, tinged slightly with blood. The heart was healthy, but seemed very pale when compared with the external muscles, which had the natural red colour. The blood was fluid, and there was very little in the heart and large vessels. The liver was healthy, but small and pale. The intestinal canal contained some bluish-black fluid, and the coats were pale.

The viscera did not then present any morbid appearances, and

if we except the sero-sanguinolent effusion into the pleural and pericardial cavities, the only points worthy of notice were the bloodless appearance of the viscera, the absence of coagula from the heart, and the small quantity of blood in its vessels.

It is seldom that *purpura hæmorrhagica* is met with in so intense a form as in this case, its severity being shown by the purple blackness of the face, hands, and feet, the swelling and congestion of these parts, the scarlet-purple appearance of every other part of the surface, and by the copious hemorrhage from so many parts, the nose, mouth, eyes, ears, and even the hands. At a later period, when there was much prostration of strength, and an offensive odour from the body, the case resembled malignant typhus, and it appeared as if the vital properties of the blood had been destroyed by the introduction of some poisonous agent into the circulation, the patient having been previously strong and healthy. He had not, however, been living upon salt provisions, and was not aware of any cause that could have induced the disease, except it might have been the syphilitic affection, or the mercury which had been taken, without, however, having eradicated the disease.

The treatment, which consisted in the employment of purgatives, turpentine, vegetable and mineral acids, and quinine, seemed to exert little if any beneficial influence over the disease; and, indeed, it can scarcely be said that we are acquainted with any remedy capable of directly restoring the vital properties of the blood, or of repairing such a disorganized condition of the globules as was discovered by the microscope.

### 9. Cases of Dysentery. By JAMES TURNBULL, M. D.

Case 1.—Joseph Connor, aged 19, was admitted into the Northern Hospital on the 24th September, having been ill with dysentery for three weeks. There was much thirst, loaded tongue, quick small pulse, and coldness of the skin. He had incessant calls to stool, and much straining, the motions consisting of coagulated blood and red serum, with feculent matter. He took for some time two grains of calomel, with half a grain of opium every fourth hour, but without the mouth being affected. Starch injections, with acetite of lead and laudanum, were frequently administered, but he gradually became weaker, and died on the 3d of October.

*Inspection.*—The peritoneal cavity contained some reddish fluid. The ascending layer of the transverse meso-colon was very vascular, and many of the mesenteric glands were enlarged. The cellular tissue round the bladder and rectum was very vascular; and this accounted for the difficulty of which the patient had complained in making water. The small intestines were



empty and quite healthy. The mucous membrane of the whole of the large intestines was very vascular, especially on the prominent parts of the folds, varying in colour from grey to dark-brown. There were many dark spots, especially in the arch of the colon, and also small holes in the mucous membrane, varying from the size of a pin's head to that of a split pea. The cæcum and rectum were the parts most affected by the disease. In the former were several small ulcers which seemed nearly healed. In the sigmoid flexure of the colon there was one large ulcerated surface and several smaller ulcers. In the rectum there was one long ulcer running longitudinally, an inch in length and a quarter in breadth, and exposing the muscular fibres. The gall-bladder was moderately distended with bile, and the liver healthy.

Case 2.—T. B., an omnibus driver, was admitted into the Northern Hospital on the 23d of October, having had bowel complaint for two months, and purging of blood for three weeks. He was very weak and emaciated. The pulse was small and weak, and the surface cold; the tongue dry; and the motions very frequent, sometimes amounting to fourteen in the night, and consisting of a muddy fluid, at times of a red colour. He was treated with Dover's powder, and mercury with chalk, and afterwards with small doses of calomel and opium, and injections of starch and laudanum. On the 26th the calomel and opium was laid aside, and he took a mixture with aromatic confection, laudanum, and ipecacuan, but this seemed of no service. A blister which was applied would not rise, and the only remedies which gave him any relief were the starch and laudanum injections, and warm turpentine fomentations. On the 30th he had hiccup, and on the 1st of November he died.

*Inspection.*—The peritoneal cavity was healthy, and contained no fluid. The *appendices epiploicæ* were vascular. The upper part of the small intestines contained mucus deeply coloured with bile. There was some vascularity at the lower end of the ileum, and its contents were of a greenish colour. The large intestines were so much disorganized that the arch of the colon was ruptured in removing it, and the rectum was broken across. The whole of the large intestines were excessively thickened, and contained a muddy fluid mixed with shreds of lymph. Some transverse vascular strips of mucous membrane were visible in the cæcum and arch of the colon. In every part from the cæcum to the rectum there were ulcers of various sizes or a coating of lymph. The smaller ulcers were not less in size than a split pea, and of an oval or rounded form. The larger were rough and elevated. The lymph was effused chiefly in the cæcum, the sigmoid flexure, and the rectum, and in the latter it formed a perfectly continuous coat of false membrane, which could not be scraped off. The liver was coarse in structure, and the gall bladder nearly full of bile.

**Case 3d.—Dysentery and Abscess of the Liver.**—A man, about 24 years of age, was brought to the Northern Hospital on the 24th of December in a state of great weakness, and much emaciated. He had just returned from Rio Janeiro, where he had been for some time, but had not, while there, enjoyed good health. About six weeks ago, soon after he sailed, he was much exposed to wet, and was attacked with dysentery. Having no medical treatment he got gradually worse. The stools were very frequent, and consisted of blood, mixed with what appeared to him pieces of raw flesh. When admitted he had very much the appearance of a person in the last stage of pulmonary consumption. The calls to stool were still very frequent. The pulse was small and weak, and the tongue dry, with a dark fur posteriorly. There was scarcely any tenderness of the abdomen on pressure. Ten grains of Dover's powder with four of mercury with chalk were given thrice a-day; and an injection with twelve grains of acetite of lead and forty minims of laudanum was administered night and morning. The following day there was scarcely any change; but on the succeeding day the diarrhoea had stopped, and there was tenderness of the abdomen on pressure. The pulse was 120, very small. On the 27th he died.

**Inspection.**—There was recent inflammation of the peritoneum, especially of the portion covering the liver, and lymph was effused along the edge of this organ. The left lobe was adherent to the stomach, and on separating them the contents of a large abscess containing curdy purulent matter was effused into the cavity of the abdomen. The coats of the adherent portion of stomach were softened, and perforation would soon have occurred had peritonitis not come on. There were several small abscesses in the liver, and one large collection of fetid sero-purulent matter towards the centre of the organ. It was much enlarged, very red in some parts, and blood exuded abundantly when it was cut. The spleen was large. The large intestines were thickened and indurated throughout their whole extent. There was vascularity of the mucous membrane, and it was of a reddish brown colour, and in some parts grey. The ulcers were large and deep, most abundant in the descending colon and sigmoid flexure.

During the year terminating 31st December 1846, 105 cases of diarrhoea and dysentery were treated in the Northern Hospital, and of these 16 proved fatal, most of which were, like those now related, admitted in a very advanced stage of the disease. Abscess of the liver was not found in any of the other cases which were examined.

10. *Case of Strangulation of the Jejunum.* By J. M. BANNER, Esq., F. R. C. S., Consulting Surgeon to the Northern Hospital. Thomas Brix, aged 27, of tall stature, healthy complexion, and muscular; by trade a draper.

November 12th 1846.—Was seized with griping pain near the umbilicus, and vomiting, which had continued during the night. This morning he feels faint and dejected; the pain continues at intervals, with frequent vomiting; the tongue is covered with thick white coating; the pulse is weak, at 98. The abdomen is flaccid; the pain is not increased on pressure; the bowels were slightly relieved yesterday, but not since. He has not taken any medicine, but has applied warmth externally.

℞. *Calomelanos* gr. ij.; *Pulv. Opii* gr. ½; *Conf. Rosæ* gr. ut *ft. pil. 3tia* *quaque hora* *sum.*; *Ol. Ricini* ʒvi. *statim*; brandy in small quantities.

8 o'clock P. M.—The pills and oil have been ejected. The countenance is more haggard; the pulse weaker and quicker; the pain and vomiting continues unabated.

*Repet. Pilul. 2da* *quaque hora*; *Enema Amyli* in *Ol. Terebinth. 3tia* *quaque hora*; and turpentine applied externally.

11 P. M.—The vomiting has ceased for nearly two hours; the pain is comparatively slight; the pulse is very weak and quick; the enema has brought away a small quantity of stool. To continue the remedies.

13th.—He has passed a very restless night; constantly eructing, at which time he parts with a mouthful of yellow fluid from the stomach; the countenance is very anxious; the pulse very weak and quick; the abdomen full above the umbilicus; flaccid below. The fulness produced from flatus, as indicated by percussion. Mr Bickersteth visited the patient to-day, and recommended *mur. morphia* and prussic acid, large injections and fomentations.

5 P. M.—The vomiting has returned with increased pain; the pulse is firmer; the bowels do not act.

To resume the calomel and opium, and discontinue all other means.

11 P. M.—The violent vomiting has ceased, but the eructation continues, with the ejection from the stomach, apparently without any effort; complains of extreme exhaustion, and is constantly asking for nourishing diet, such as eggs, which has been the case from the first.

14th.—He died during the night.

*Inspection.* — The stomach, duodenum, and part of the jejunum were much distended with air and a small quantity of yellow fluid; below this the intestines were empty, collapsed, and very much smaller than natural; the lower part of

the jejunum and upper part of the colon were dark, from congestion. There were several adventitious bands, of long standing, (indicated by the strength and density of their texture,) passing from one convolution of the bowels to another. One in particular was most striking in these respects, which passed from the jejunum to the sigmoid flexure of the colon; this band was closely connected with the intestine for some distance along its course, and there attaching itself to the sigmoid flexure, formed a very small arch or passage, large enough to admit the little finger, through which a large fold of jejunum had passed downwards, and having got tilted over the band, re-entered the arch, forming completely the first tie of a common knot in the gut. This was the cause of death. Below the knot the intestines were quite empty; above it they were filled with flatus and fluid, as was also the stomach; the constriction was not sufficient to produce complete strangulation, yet the bowel for a short distance below it was considerably congested.

There was a singular appearance in the right iliac fossa. The colon was here firmly adherent at a number of very small convolutions, which gave it a fimbriated appearance. The adhesion was so firm that it could not be separated, and the continuity of the gut could not be traced, from the complexity of its twisted state and adhesions. On cutting behind the adhesions to some depth, it was found that one angle of gut had been cut through, which had passed through the fascia covering the muscles, leaving an open mouthed gut of at least half an inch in depth. The intestine above and below this adhesion was pale and very small; there was not the least appearance of recent disease at this point. The omentum was attached to the lower parietes by old and strong adhesions. The other viscera were healthy.

The patient had a similar attack to the one now related two months prior to this, which yielded, under similar treatment, in two days, and he perfectly recovered. He was not aware of having at any time suffered from inflammation, nor was he aware of having had abscess or anything indicative of the inflammation which must have existed in the right iliac fossa. His health for many years had been good.

#### 11. *Cases of Soft Cancer of the Liver.* By JAMES TURNBULL, M. D.

CASE 1st.—Francis M'Guire, 45 years of age, was admitted into the Northern Hospital on the 12th of September, and continued there until his death on the 22d. He had just returned from New York, and was much emaciated, deeply jaundiced, and had a large tumour in the situation of the liver. Two years before he had strained his side in lifting a heavy weight, and ever after

had some pain and swelling in the part. The swelling did not, however, attract much attention till about a year ago, when it began to increase rapidly. On admission there was a large, irregular-shaped, prominent tumour in the region of the liver. At the most prominent part it was soft and felt almost as if there was obscure fluctuation. The rest of the liver was hard and distinctly nodulated. It increased very rapidly during the ten days he was in the hospital, and he became of a darker yellow colour. He had much pain and distension in the tumour, and for three days before he died there was frequent vomiting of dark glairy mucus. The bowels were easily acted upon by medicine, but the motions were of a light colour.

*Inspection.*—The liver was enormously enlarged, weighing 13½ pounds. There were numerous nodulated prominences of a whitish colour and round or oval form, presenting generally a cup-like depression at the centre. From the centre to the circumference were red lines, which gave the tumours a very peculiar appearance. The pylorus was thickened and of cartilaginous hardness. Some parts of it when cut had a soft fungoid appearance. The mesenteric glands were enlarged and converted into a yellowish white substance like the tumours of the liver. Some of the bronchial glands were affected in a similar manner. There was a puckered appearance at the upper part of the right lung, in cutting into which a group of tubercles was discovered, which were of the size of peas, and contained tubercular matter of the consistence of cheese.

*CASE 2d.*—Daniel Dunlop, a sailor, 27 years of age, was admitted into the Northern Hospital on the 27th of June, in a state of extreme emaciation and weakness. He could give no account of himself, except that he had recently returned from South America, and had been ill for a very considerable time. He had no pain anywhere; the tongue was clean; there was no thirst; there was constipation, but no fulness or tenderness in any part of the abdomen; the pulse was weak, but in other respects natural; the bowels were kept open by aperient medicine, which had to be given in rather large doses. The patient had occasional attacks of sickness and vomiting, but at times took his food pretty well. On the 9th of August there was some delirium, and he passed into a state of stupor. From this condition he was roused by means of stimulants,—wine and carbonate of ammonia; but after this he gradually became weaker, and died on the 20th of August.

*Inspection.*—The liver was small. On the surface were many white tubera, varying from the size of a pea to that of a walnut, and having the same cup-like depression at the centre, and striated appearance noticed in the last case. The same soft white tubera were found through the whole tissue of the organ. The mesen-

teric glands were enlarged, and had the same structure as the tubera of the liver. There was scirrhus thickening and hardness of the pylorus. Throughout both lungs small reddish bodies were found about the size of peas, less firm than hepatized lung, but resembling it much in appearance.

12. *Partial Fatty degeneration of the Kidneys.* By  
T. INMAN, M. D.

There was no history connected with this case, beyond that the patient, from whom the specimens had been taken, had died of valvular disease of the heart, without having suffered from any renal symptoms.

Both kidneys were less than usual, but full of blood, except in two parts, where they were extensively puckered in, and of a yellowish colour, as if cicatrized. On incisions being made through the organs, the morbid appearance was found to be confined to the cortical substance, a thin outside layer of which was alone affected. Amongst the diseased part a number of islands (so to speak) of healthy tissue were found. The yellow mass was similar in appearance to diffused atheroma, and was surrounded by a vascular ring, which continued visible after prolonged maceration, and was evidently due to overdistension of the capillary vessels. On subjecting thin sections of the kidneys to microscopic examination, it was found that the urinary tubes in the diseased part were reduced to half their usual size, and filled some with a dense oleaginous material, which made them perfectly black by transmitted light; others with dark brown coagula of blood, evidently of old standing, as they had become irregular in size and shape. Inter-mixed with these were tubes of ordinary size, containing an abnormal amount of oil or fat globules, but not sufficient to render them perfectly opaque. These were to be found in the greatest abundance in those small healthy-looking portions, which existed here and there in the midst of the diseased mass. Wherever the yellow colour could be traced, the same appearances were found; while in the remote parts of the organ no departure from the normal condition could be seen.

The capillary vessels seemed entirely free from deposits; but the Malpighian tufts were in many instances gorged with fat, though, as a general rule, they did not partake of the disease to the same extent as the urinary tubules.

The substance of the kidney lying between the tubes and capillaries was loaded with fatty globules to a considerable degree. No new structure, however, was to be seen, nor any lymph corpuscles, to lead to the idea of inflammation having taken place.

The author is inclined to suppose that this is a case in which granular degeneration had gone through all its stages without implicating any of the parts beyond those it first commenced in.

The existence of coagula which had been partially absorbed indicated a state of great congestion at some previous time. The absence of epithelium cells in the tubes that were filled with fat is presumptive proof that the deposit had been much greater than it then appeared; while the reduced size of the diseased tubules, and the greater density of the fat they contained, showed that absorption had been actively at work. The contraction of the tissue is precisely such as we have in the last stage of Bright's disease, and may be considered as due either to the atrophy necessarily dependent upon a diminished supply of blood, or the absorption of the more fluid parts of the original deposit.

### 13. *Case of Ulceration and Inflammation of the Urinary Bladder.*

By T. INMAN, Esq. M. D.

C. D., aged 29, came under my care in the lock wards of the Liverpool Workhouse, with gonorrhœa and soft warts, the latter occupying the fold of the groin and inner parts of the thigh, as well as the labia and orifice of the vagina. She stated that she was in the fifth or sixth month of pregnancy.

The usual remedies were adopted for the venereal symptoms, and under their use she began steadily to improve. Six weeks, however, after her admission, she was seized with pain in the region of the bladder, and frequent desire to micturate, every effort at which was agonizing. The pulse was little accelerated, and the constitution did not seem to sympathize very deeply. On examining the urine it was found to contain large quantities of purulent matter and blood. Leeches, fomentations, and saline purgatives, followed by opiates both "orally and anally," soon subdued the more acute symptoms. The pain during micturition, however, and the constant desire to urinate continued, and the patient passed urine containing large quantities of pure purulent matter unmixed with any mucus or blood.

A variety of measures was resorted to; leeching, injections into the bladder of various kinds, (including vegetable and mineral astringents, sulphate of zinc, and nitric acid,) and suppositories in the anus and vagina. Various medicines were also used internally, such as are usually considered to have a specific or decided action upon the urinary passage. None of these means proved efficacious, and we were obliged to rest all our treatment upon the palliative effects of opium. The effect of this drug, taken internally, was always to reduce the secretion of purulent matter, and enable the patient to hold her water for some hours. The improvement, however, as might have been expected, was only temporary, and at her confinement, (which took place at the full time,) the disease was in the same condition as it was two months before. The delivery of the child was followed by considerable hemor-

rhage, under which she almost sunk. She rallied again shortly, but only to suffer from a more fatal accident—the occurrence of puerperal peritonitis of a most intense character—which carried her off in three days.

*Inspection.*—Abdomen considerably distended. On opening it the intestines were found glued together by recent lymph, a quantity of purulent-looking matter being contained here and there amongst their interstices. The bladder was obtained with the greatest difficulty, and a portion only could be cut away. On examining it, the mucous membrane was found extensively diseased, being evidently considerably inflamed, and presenting precisely the same appearance as the conjunctiva, when the lids are “granular.” No ulceration was found, but there existed two or three whitish spots, where we were led to suppose that ulceration had existed, followed by cicatrization.

Three other cases have come under the author's observation, which would lead him to suppose that the disease alluded to above is one of the most intractable kind. The first occurred in the practice of Dr Budd, at King's College Hospital in London, and was published by him in the Medical Gazette. In it the whole of the mucous membrane of the bladder was destroyed by ulceration, and the disease had extended upwards to the kidneys.

The second was that of a young woman who was sent to Liverpool from Wales. She was about 22 or 23 years of age, slightly formed, and of sedentary habits. The catamenia had disappeared for some months, but the general health was good. The report I received from her medical attendant was, that he considered it a case of albuminuria, with more irritability of the bladder than usual. She herself complained simply of pain in the bladder, and constant desire to urinate. On examining the secretion it was found to coagulate with heat and acids; but on examining it microscopically, I found that its most prominent character was the presence of a large quantity of pure purulent matter. The passage of a catheter produced much pain, especially when one part of the bladder was touched. Considering this a case of chronic ulceration of the mucous membrane, I ordered leeches to the vulva repeatedly, hot fomentations, hip baths, injections into the organ, suppositories, and blisters to the thighs to be kept open; directing at the same time all my efforts to bring back the catamenia, and keep up the strength of the system. My efforts to cure were, however, quite unavailing. Occasionally for a week or a fortnight the disease would appear to have left her; the pain ceased, and the quantity of purulent matter in the urine greatly diminished. These symptoms of improvement were always delu-



sive, and usually followed by an aggravation of the complaint. The catamenia returned regularly, but no alteration was produced; and opium was at last resorted to, as the only thing which appeared to exercise any influence over the symptoms. Under its use the sensibility of the mucous membrane was reduced, and the urine could be retained for about three hours. At last, after having been under notice about four months, she went home again to the country, in the same state as when she came, with orders to continue the opiate pills, and to be as much in the open air as possible. The first intelligence I had of her, after her return, was that she had become dropsical and was very ill. The next, some months afterwards, was to the effect that she had perfectly recovered, and had not had any pain or micturition, or any urgent desire for some weeks.

The third case occurred in a lady who was suffering from cancer of the uterus and probably of the liver. Her chief suffering, towards the conclusion of her disease, was from pain in the bladder, with sensation of intense heat, and constant desire to urinate. On examining the water it was found to contain large quantities of pure purulent matter unmixed with mucus. As in the other cases, all attempts at cure were hopeless, and opium formed the only means of palliation.

In all these cases the urine presented precisely the same appearance. When seen in large quantity it had an oily look, as if it would not have formed bubbles with shaking, and a dulness, only a shade or two removed from the sparkling clearness of the healthy secretion. It was acid or neutral when passed; did not rapidly decompose; was coagulable by heat and acids, showing the presence of a small quantity of albumen, and deposited on standing a thin layer of a grayish colour, which was found to consist entirely of pus globules, single or aggregated. The general health did not appear to have much influence on the complaint, or *vice versa*; and where death ensued, as it did in the first instance, it was caused by a gradual exhaustion of the powers from prolonged pain.

The long duration of C. D.'s case before her death from another disease, and the still longer time in which the second case suffered from the complaint, goes to prove that it is not one which tends to shorten life except by the suffering it may induce.

The *post mortem* appearances, where they could be investigated, throw some light upon the complaint. In one we have ulceration, in the other a granular condition of the mucous membrane,—both sufficiently difficult of cure when they present themselves in those parts to which we have much freer access than to the bladder.

But what shall we say of the treatment? The indications are plainly to keep up the general health, to avoid irritating food or drinks, so as to keep the urine as neutral as possible and as little irritating; to palliate urgent symptoms, and to endeavour to remove the disease. The first are easy; but enough has been said to show how almost hopeless is it to fulfil the last.

14. *Cancer of the Cervix and Body of the Uterus.* By GEORGE PADLEY, Esq.

Ann Furniss, a widow, aged 40, was admitted into the Infirmary, February 13th 1847, under the care of Mr Cooper. She had the following symptoms:—An emaciated and much enfeebled frame; an anxious expression; a sallow complexion, yet with some remains of what appeared to have been “a good colour.” The right leg up to the hip greatly distended by œdema: to this she at first directed chief attention; the left leg but slightly so. On examining the abdomen, a large, solid, slightly moveable tumour was found rising above the pubis, equal in size to a child’s head, its centre corresponding with the median line of the body; not very painful when gently manipulated, but otherwise the source of great suffering,—this being increased in proportion as she assumed an upright position, when a sensation of “bearing down” was experienced. The pain was referred chiefly to the tumour and its neighbourhood, but extended also down the thighs. It remitted at intervals, but had become more constant as the disease advanced, and generally increased towards night. She suffered also from dyspnoea and cough, with muco-puriform expectoration, which, shortly before her death, became slightly tinged with blood. Her easiest position was recumbent on the right side; and while sitting in the bed she used to lean to that side; for then not only was the pain diminished, but the breathing less oppressed. For the first few days after her admission there was retention of urine, requiring the use of the catheter; after that time the natural effort was sufficient. The bowels were constipated, but easily acted on; the appetite bad; the sleep broken. Febrile symptoms, of a hectic character, appeared occasionally. About three weeks before her death nearly a pint of dark coagulated blood—very offensive—was suddenly discharged, (there is no doubt from the uterus,) with much relief to her sufferings, and diminution of the tumour. This was followed by a leucorrhœal kind of discharge. The vital powers were gradually exhausted, but the pain never returned to the same amount as before. She died, March 28th, six weeks after admission, retaining her consciousness nearly to the last.

When about 20 years of age, she gave birth to a dead child. About the commencement of the labour she was seized with a

convulsive paroxysm; the labour was a difficult one; the child delivered by instruments, and much hæmorrhage ensued. This was followed by puerperal mania, which continued about a fortnight, leaving her much weakened and reduced. From that time she frequently complained of pain in the abdomen, towards the left side. Her health was otherwise generally good. It is about nine months since the disease here described first attracted attention.

The treatment while in the house consisted of mild aperients; mercurial alteratives with conium; morphia at night; *Liq. ammon. acet. c. Spir. ather. nitric.*, when there were febrile symptoms; and mild expectorants; nutritious diet and wine; fomentations, and *Empl. hydrarg. c. Ammoniac.*, applied over the tumour. Her sufferings were somewhat alleviated, and strength supported by these means.

On examining the body, the tumour felt in the abdomen was found to consist, as had been concluded, of a diseased uterus having the following characters:—

Its greatest circumference, 16 inches; length, 9 inches; weight very nearly 4 pounds; pyriform in shape; the cervix forming a distinct and well-defined mass, the size of an orange.

Owing to the equal development of the disease on both sides of the median line, there seemed nothing, beyond the usual position of the patient, to explain the extremely œdematous condition of one leg, and the comparative freedom from this state of the other. On dissecting more deeply, however, I found lying upon, and firmly attached to the promontory of the sacrum, a diseased mass, similar in character to that composing the greater part of the body of the uterus, projecting, at its thickest part, from the bone nearly an inch. The situation of this part was to the right of the median line; and between it and the body of the uterus lay the right common iliac vein, near its bifurcation. The mass thus attached to the sacrum was the only appearance found of disease similar to that of the uterus, and it becomes a question what influence the contiguity of this organ had in producing it. The layers of peritoneal membrane were entire between them.

A longitudinal section disclosed two entirely distinct conditions of the disease, affecting respectively the cervix and body. The former having the characters of scirrhus—hard, containing fibrous septa, and a thin whitish matter obtainable by compression. There was no appearance of ulceration. The latter (which composed four-fifths of the whole mass) having those of encephaloid disease, of different consistence and shades of colour, in different parts—some being firm, others soft and pulpy, and others of medium consistence, with a granular appearance. Here and there blood-vessels were seen, and the parts around tinged with

blood. At the lower and posterior part of the body, and connected with the muscular parietes, the diseased structure was hard and similar in appearance to that occupying the cervix; but anteriorly, and in immediate proximity to the latter, it was soft and pulpy as the rest. There was a well-defined line of demarcation between the two structures, and on further examination a septum could be traced between them. The muscular structure, of about its natural thickness at the posterior and inferior part, expanded over the mass until nearly all trace of it was lost at its upper and anterior portions, becoming thinner and degenerated as it was traced upwards. Some firm, rounded masses were imbedded in its substance, lying beneath the peritoneal coat. The cancerous material was apparently deposited between the muscular structure and the mucous membrane, as the cavity was still lined by the latter.

These forms of disease, thus associated in the uterus, are of very unfrequent occurrence. This will appear from the following statements by Dr Walshe. "In very rare instances true encephaloid tumours originate in the body of the uterus." "In rare instances cancerous disease appears first in the body of the organ. Still more rarely do the body and cervix become coetaneously and separately affected." In the present case it is by no means probable that the affection of the body and fundus of the organ was derived from that of the cervix; although I am aware that, under certain circumstances, scirrhus in one part of the body may give rise to the formation of encephaloid in another part. The very advanced stage and extensive development of the former; the still hard, unulcerated, and less advanced stage of the latter; the distinctive characters and abrupt line of separation between the two; with the fact that when cancer extends from the cervix to the body, it is by gradual infiltration, and conversion into that form of the disease by which the cervix is itself affected, and this not until ulceration has at least commenced—the disease spreading upwards as this process advances; render the idea of the whole mass of the one being produced by extension from the other scarcely tenable, and induce me to consider this as one of the "rare instances" in which not only "true encephaloid disease has originated in the body of the uterus," but in which "the body and cervix have become coetaneously and separately affected."

If the other view, however, should be taken of the case, which the existence of the harder portions in the body before described, would seem in some degree to favour, still it is extremely rare to find this part (the body) so entirely involved in the disease, and so far advanced in the progress of destruction—this also, chiefly in the upper portion, and, therefore, most distant from

the cervix—while the latter does not present a trace of the ulcerative process having commenced.

The os and cervix, as seen and felt *per vaginam*, presented a surface, smooth, hard, round, and having very little inequality. The vagina was unaffected by the disease. The appendages were attached to the body by adhesions, but were free from cancerous deposit. Each ovary contained a cyst filled with a dark, rust-coloured, tenacious fluid. The lungs were affected with emphysema and bronchitis.

The following were the characters presented by different portions of the tumour upon a microscopic examination. The softer and more pulpy portion of the body was found chiefly to consist of cells—the predominant form being irregularly caudate—many of them prolonged into filamentous processes, some finely drawn out, and of very great length. Part of the apparently fibrous structure which traversed the mass was evidently composed of these cells: they could be traced within the mass and extending beyond its margin; and some being altogether detached, the cell character, and granules contained within, could easily be recognised. It appeared to contain, besides this, a true fibrous stromal structure, very delicate, but distinctly visible. It was difficult, however, to ascertain whether this might not have been due to the filamentous prolongations before described. The remainder was composed of cells more or less irregularly spherical, numerous interspersed granules and molecules, some compound granular masses, and surrounding blastema. In many of the cells distinct nuclei with nucleoli were observable, but in most the contained granules and molecules were scattered in the interior. They were made more evident when acted on by acetic acid, and in a few cells which floated and rolled over in the fluid, the molecules—minute transparent bodies—apparently adhered to the parietes. By pressure these were scattered in great abundance over the field of view, of various sizes, most having a rapid oscillatory or revolving motion. In one the membrane was seen ruptured at one part with the molecules as if just emitted from it. The existence of cells within a parent membrane was also evident in a few instances; two, three, four, or more being inclosed in one common developement. In the harder portions of the mass the cells were more regular in outline, more equable in size, and not generally so large, the proportion of the fibrous structure (of cell formation) being greater. Numerous fat globules were also recognised. A portion from the cervix was found to be composed of cells of a more globular character than the others, and comparatively few in number; a fibrous structure, of which the greatest part was made up; and granules. In a portion finely

spread out, the fibrous character had here also very much the appearance of being formed of lengthened cells.

15. *Case of Fibrous Tumour of the Uterus.* By W. H. FITZPATRICK, Esq., M. R. C. S.

On the 21st of July 1846, I was summoned to see Mrs G—a widow, aged 46, who had been twice married, and was the mother of two children.

About eighteen months after her second marriage, previous to which she had always enjoyed good health, she complained of pain in the right iliac region, and perceived a tumour the size of a large nut. She consulted a practitioner in town, who told her it was a tumour on part of the large intestines. She remained under his care, occasionally consulting him for eighteen months; but the tumour continuing to increase, she suffered much inconvenience from its extension upwards. She consulted another practitioner, who made a vaginal examination, and considered the disease to be fibrous tumour of the uterus. She then went to London and consulted Mr Liston as to the propriety of its removal, which he considered impracticable. While under the first practitioner, the catamenia became irregular, coming on sometimes once a fortnight or three weeks with very profuse discharge, which reduced her strength much. At this time she could not void her urine without the catheter. The tumour continued visibly to increase, and by pressing upon the diaphragm, produced severe attacks of dyspnoea. At the time I saw her, the tumour occupied the whole of the abdomen and the epigastric region, and she looked much larger than a person arrived at the full period of utero-gestation. She felt most relief when lying on either side, as the dyspnoea was increased when she lay on her back. At this time there was cedema of the whole body; she was flooding most profusely, and was quite collapsed. I gave her brandy and tincture of opium, and when she rallied, a mixture with infusion of roses, *sulph. mag.* and *tinct. opii*. Cold cloths were also applied to the external parts and hot jars to the feet. The next day the hemorrhage abated, and I ordered a mixture with decoction of cinchona, nitric acid, and tincture of opium, and at night a morphia draught to relieve the pain and produce sleep.

On the 23d she had passed a quiet night and felt better. The medicines were continued.

On the 25th she got up and lay on the sofa. She felt strong, but complained of great difficulty in passing water, of which, however, but little was secreted. A mixture with *Liq. potassæ* and *Tinct. hyoscyami* was now given her, which increased the secretion, and she began to gain strength daily; but having on one occasion exerted herself too much, the hemorrhage returned

as violently as before, and was accompanied with œdema of the left leg. The acid mixture was repeated, and as she was suffering much from distension of the limb, a dozen leeches were applied in the course of the femoral vein, and afterwards fomentations and poultices, which gave her great relief. Though the hemorrhage ceased, she continued to sink until the 6th, when death ended her sufferings.

*Post mortem.*—No disease was found in any organ except the uterus. The lungs were quite healthy, but much compressed; the liver small and pale; the intestines quite healthy, but perfectly white; the kidneys small and pale; the bladder much thickened. The uterus was very large, weighing nearly ten pounds. The body was slightly nodulated in some parts, and on making a section it presented an anæmic fibrous appearance. Smaller tumours, some about the size of walnuts, were found imbedded in the larger one. The source of the hemorrhage could not be discovered.

16. *Case of Cauliflower Excrescence of the Cervix Uteri, Removal of.* By EDWARD PARKER, Surgeon, Kirkdale. Communicated by Dr Watson.

Hannah Hayland, aged 36, married. Fifteen years ago had a child, which she suckled for four years; had a fall five weeks before the expiration of the term of pregnancy, which brought on premature labour. A week after her confinement had severe flooding, which continued for five months, and then gave way to a leucorrhœal discharge, which has continued ever since; has frequently suffered from pain in the lower part of the back, shooting down the right thigh and the lower part of the abdomen, with occasional bearing-down pains. Up to April last her health continued pretty good, but about that time the flooding returned, and has continued to recur frequently, the slightest cause being sufficient at any time to produce it; when not flooding there is a discharge of thick yellowish matter, which of late has become of a very offensive odour. She is now much reduced and very feeble; her appearance sallow and anæmic; has frequent palpitation; headach; dyspeptic symptoms; loss of appetite; and foul tongue; pulse 92, feeble; skin cool; incontinence of urine; occasionally anasarca of the feet; when straining at stool, has prolapsus of the uterus, which has once or twice protruded externally; has no affection of the breasts. On making a vaginal examination a large cauliflower-like excrescence is found to occupy its upper part; its surface is rough and bleeds from the slightest touch; the finger can be passed completely round it, and it seems to involve the whole of the posterior lip of the *os. uteri*; the anterior lip, though swollen, and somewhat enlarged, not appearing to be engaged in

the tumour; the neck of the uterus feels somewhat hard. Examined by the speculum, the surface of the excrescence presents a fungoid appearance, and small portions of it can easily be brought away with the finger.

January 11, 1847. Assisted by my friends Dr Watson and Mr Harris, I amputated the diseased cervix, having previously endeavoured to produce insensibility by the inhalation of sulphuric ether, but without success. Having fixed a couple of strong double hooks into the cervix above the excrescence, it was easily brought down by moderate traction so as to expose the healthy portion of the cervix, which was easily divided with a strong bistoury. Considerable hemorrhage ensued, which was arrested by plugging the vagina at once, as the debilitated state of the patient rendered it advisable that she should not lose much blood. On examination, the mass, about the size of a small orange, soft, and pliable, was found to engage the whole posterior lip of the *os uteri*, involving also both commissures. The anterior lip appeared healthy, as also the line of incision, except that a small portion, which corresponded to the posterior lip, presented a darkish colour.

In the evening she complained of pain in the right iliac region, distension of the vagina, and inability to make water. The whole of the plug was removed without giving rise to any bleeding, and the bladder was then relieved. Pulse 100, sharp. Ordered a bran poultice and 40 minims of *Liq. Opii Sedat.*

January 22d. Has continued to progress favourably; is improving in health and strength; has had no incontinence of urine since the operation. Examined to-day with the speculum, the cut surface of the cervix presents one or two white gelatinous-looking spots, to which it was deemed advisable to apply the actual cautery. This was done and produced little or no pain. About a fortnight after this time she had so far recovered her health and strength as to be able to leave for a distant part of the country, and has not since been heard of.

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ART. IV.—*On the Analogy of Ringworm, and of some other Skin Diseases, to Fairy Rings.* By ROBERT E. BROWN, M.D, Edinburgh.

It is well known that several of the diseases affecting the skin of man and of some of the lower animals invariably assume a form more or less circular. This is particularly noticeable in *tinea capitis*, and in some varieties of lepra; and the term ringworm, by which the first of these diseases is popularly known, is derived, in part, from this circumstance. I am not aware that any attempt has been made to explain this matter, or that it has



been regarded in any other way than as an ultimate fact. The cause of it is not only a matter of some interest, but it might possibly be of some practical importance in the treatment of these affections; and I propose in the following communication to attempt to indicate an explanation of it, by endeavouring to draw an analogy between these diseases, and those appearances termed fairy rings, the cause of which appears to be well made out. It may, perhaps, seem to some as if this was a subject on which little required to be said. It may be thought that the circular form of these skin affections depends simply upon the fact, that the disease originates in a point and has a tendency to spread; and that it follows almost as a matter of course, or of the utmost probability, that it will extend in a circular direction. There may be some plausibility in this: but still, Whence is this tendency to spread? and what is the nature and history of that process? These are the questions on which it is more particularly the object of this communication to endeavour to throw light.

Upon meadows and old pasture grounds, there not unfrequently occur rings of dark-green and luxuriant grass, which are well known by the name of fairy rings. They are most abundant, and are best known in this country, in the southern parts of England, where fields and meadows are in many districts thickly marked by them. They are met with of all sizes, from a few inches, to six, eight, or even twelve feet in diameter; and the majority of them form remarkably perfect circles, or segments of circles. A fairy ring, when watched from time to time, presents several notable points for observation. During the greater part of the year, the circle of rich green grass itself is the chief thing that can be observed; but at certain seasons there may be noticed, immediately exterior to it, another ring, composed of mushrooms or some other sort of fungous plants; and beyond these again, a third ring of brown and withered grass. The fungi met in connection with the fairy rings are the common mushroom (*Agaricus campestris*), which is found connected with rings of the largest size. The Champignon mushroom (*Agaricus orcadus*, Withering) is of more common occurrence, but the rings connected with it are smaller in size, though more perfectly circular. Besides these, there are three other fungi, which more rarely present themselves, the *Agaricus terreus*; *Agaricus Procerus*, and *Lycoperdon bovista*. The fairy rings continue visible for several years, during which time they are in a constant state of increase, varying in different instances from a few inches to two feet annually. In the course of this growth two or more not unfrequently come in contact; and when this takes place, even though the fungi of the several rings are different, they do not continue themselves into each other; but coalescing, they form one large and irregular figure.

These observations were made, and were connected together into a theory of the origin of these curious appearances, by Dr Wollaston, in an essay which is published in the *Philosophical Transactions* for the year 1807, and which displays in a high degree the ingenuity and perfection so uniformly characteristic of the observations and inventions of that philosopher. The explanation given by Dr Wollaston is very satisfactory in itself; and, being in some measure supported by recent researches, it seems to me that little doubt can be entertained of its accuracy.

According to Dr Wollaston, the rings originate in the following manner. A group of fungi spring up upon a spot of ground and flourish there until the soil becomes exhausted of some peculiar pabulum necessary for their existence. The spawn which they throw off, and which falls upon the ground already exhausted, finds no stimulus to growth, and it rots or lies dormant; but that which falls beyond this spot of ground upon the unexhausted soil, produces a new crop of the plants exterior to the circumference of the original group. These in their turn flourish for a while, throw off spawn, die, and are succeeded by a fresh ring of fungi growing round the outer border of the last. When the fungi die and rot, they act as manure to the soil, and stimulate the grass to a strong and luxuriant growth. With regard to the production of the outermost ring, consisting of withered grass, Dr Wollaston supposes that the fungi, in their vital desire for nourishment, withdraw it not only from the ground upon which they immediately grow, but also from the soil extending to a short distance beyond; and in consequence of this, the grass which grows there is enfeebled in its strength, and at last withers.

In this manner we can understand how the several rings are formed, how they follow each other in the order we have mentioned, and how they enlarge in their dimensions. The recent researches of Dr J. Schlossberger, and of Mr J. T. Way, into the chemical composition of the mushrooms, and of the other fungi connected with fairy rings, give considerable countenance to the theory of Dr Wollaston. They show that these plants abound above most, if not all others, in nitrogen, in phosphates, and in the other matters, the presence of which makes a soil rich and fruitful. In consequence of this, they exhaust the soil upon which they grow with great rapidity and effect, and again renovate its powers in like manner when they are applied to it as manure.

Notwithstanding the beauty and simplicity of Dr Wollaston's theory, there are some points in it which, on consideration, may seem to be assailable; and which, if they had been pointed out at the time of its publication, might possibly have laid it open to serious objections. It may appear in the first place, that there is

no sufficient reason why the grass is not equally luxuriant before the fungi have preceded it, as it becomes afterwards. All the most valuable substances which compose these plants, or at least the chief part of them, existed in the soil before the fungi sprung up, and when they return to the soil again in the form of decayed vegetable matter, the soil is no richer than it was at first. Why, therefore, it may be asked, should the grass grow more richly and strongly upon it then, than it did before? Again, why should the fungi form a ring or grow so well at the borders of the circle, and be incapable of growth in its interior, as Dr Wollaston's experiments indicated? After the fungi had extracted all the available food from the soil, and before their decay was so complete as to admit of the substances of which they were composed becoming again available for the purposes of vegetation, it is obvious that a stop would be put to the growth of fresh plants. But when once the decay was complete, and the plants having returned to the state of earth, had been restored to the soil from which they had sprung, it is not so apparent why their further growth should then be arrested.

In answer to these objections, it is to be held in mind that the valuable constituents of the soil, the phosphates, sulphates, and other salts of the alkalis, the alkaline earths, and the several other substances necessary to vegetable growth, may occur in forms available to some sorts of plants and not so to others. It is conceivable, and it is not improbable, that the vital force of the mushrooms may differ so much in its degree of activity, and in its mode of action, from the vital force of the grass, that the chemical or mechanical forces which preserve the substances proper for the nutrition of these plants in a state unfit for that purpose, may be resolved or overcome by the one plant and not by the other. But, whatever the explanation may be, it appears to be a fact, that one plant may thrive in a certain soil, and that another may not do so, although substances suitable for the nutrition of both may be present in it. As a farther reason for the mushrooms not growing again upon the same ground, it may be stated, that in the process of decay these plants evolve a considerable quantity of nitrogen in the form of ammonia; and that, in proportion as they do this, the soil must become in the same degree unfitted for their further production; as nitrogen, or ammonia, is one of the substances most necessary for the nourishment of these plants.

It may further seem as if there was no sufficient reason why that which Dr Wollaston conceives to take place with regard to the mushroom should not also take place in the case of nearly all other plants. If mushrooms are forced to extend outwards in a circular direction, when they have exhausted the soil underneath their

original seat, why, it may be asked, are not other plants forced to do so likewise? The reason of this may possibly depend upon the difference in the roots of the two plants. Other plants send out their roots in a circular or globular direction, and so collect food for themselves from an extensive space of soil. But the fungi being unable to do this, both from the nature of their roots, and because they spring up so quickly, are forced themselves to move outward, and seek nourishment in new soil.

Some botanists, I believe, do not accept of Dr Wollaston's theory, but ascribe the origin of the fairy rings to a mushroom spore or stem, increasing and extending itself in a circular direction. They say that the stem of the central and primary mushroom extends itself by its concentric growth from the centre of the fairy rings to their circumference, and there throws up its fructification. I am scarcely competent, from my limited knowledge of botany, to discuss the merits of this view. It does strike me, however, as a somewhat startling statement, and one the truth of which would require to be well ascertained, (which, so far as I can learn, it is not,) before founding much upon it,—that the stem of a mushroom extends itself underground till it attains the diameter of ten or twelve feet, an extent to which the fairy rings not unfrequently reach.

Having thus given a sketch of Dr Wollaston's account of the nature and formation of the fairy rings, I shall now consider those skin diseases which I conceive to bear some analogy to these formations. There has been some interest excited of late years by a discovery, made in the first instance, I believe, by Professor Owen, that vegetable growths occur in some of the diseased structures of the higher animals. Professor Owen observed these in the case of tubercles from the lungs of the flamingo; and the observations of M. Schönlein of Berlin, and of many other persons, both in this country and on the continent, since the announcement of that discovery, have shewn that vegetable growths are of constant occurrence in some diseases, and that in the case of several skin affections they appear, if not to constitute the diseases themselves, to be at least the exciting cause of them. The disease termed *tinea favosa* was the first in which these vegetations were observed to occur in man. This observation was made by M. Schönlein in the year 1839, and since that time it has been fully examined and verified by M. Gruby of Vienna, and other observers; and the same thing has been noticed in several other skin diseases. As the *tinea favosa*, however, has been made, more than any other, the subject of examination with regard to this matter, and as it is one of the most perfectly circular of the skin diseases, I shall select it in particular for the purpose I have at present in view. It is, however, to be held in mind, that what

is said with regard to this disease may be applied with like force probably to all other circular skin diseases of vegetable origin.

The *tinca favosa* commences with an increased vascularity of the skin, on and about the place where the disease is subsequently to appear; and, at the same time, some desquamation of the cuticle takes place. After this has gone on for a few days, one or more spots, of a yellow colour, appear upon the space so affected, which gradually enlarge in their dimensions, and, if they meet with no obstacle, attain to the size of a sixpence or a shilling. They are stated to be "composed of capsules of epidermic scales, lined by a finely granular mass," which is especially abundant at the circumference. The term capsule, however, appears to me to convey a somewhat incorrect idea in the description of these bodies, and one which might lead to obscurity in the following remarks, inasmuch as it indicates a continuous and defined coat or covering of the granular mass. The true account of the matter is, that the granular mass is situated between two layers of the cuticle;—the strata of which are split up in the process of desquamation with which the disease commenced. The yellow matter consists of innumerable micodermatous plants; as well as of a substance existing in greatest abundance at the periphery of the circles, which appears to be the soil from which they spring, and on which they flourish. The plants are very low in the scale of organized bodies, consisting simply of long, regularly-jointed, cylindrical filaments, terminating at their extremities in round or oval globules, which are probably the sporules of the plant. On examining a circular patch of the disease microscopically, the plants may be observed as filamentous lines, springing from the outer parts of the circle, and radiating inward towards the centre, where they generally terminate in a row of the sporules to which we have above alluded. About the centre itself, there may be observed a great accumulation of these beads or sporules, mingled with epidermic scales, and agglutinated together by exudations from the plants and the animal tissues.\*

Having in the foregoing pages described the facts relating to the fairy rings, and to the *tinca favosa*, which are necessary for my present purpose, I shall now endeavour to point out the analogy which I conceive to exist between them. The growth of the mycodermata begins in the first instance, as I have already stated, at a point. The soil, or other source of nourishment connected with this point, cannot be expected to last very long; especially when it is taken into account how comparatively great a quantity of

\* For much of my information respecting the vegetations and microscopical appearances of *tinca favosa*, I am indebted to a Memoir on these subjects by Dr J. H. Bennett, published in the Transactions of the Royal Society of Edinburgh, Vol. xv.

highly organized sporules and secretions the plants throw off, and which constitute some portion of the scurf and scales that perpetually separate themselves from the affected part. When the soil, therefore, at the point upon which the plants first spring is exhausted, they seek for nourishment on the parts exterior and contiguous to it. This, in its turn, is gradually exhausted of the required pabulum, and a further extension takes place; and so the circumference of the circle gradually and constantly progresses outwards, in the same way as the fairy rings. Exterior to the circle of plants, the skin is slightly reddened and inflamed, presenting the appearance of an outer ring. This may possibly arise from a cause similar to that which Dr Wollaston thinks gives rise to the outer circle of withered grass which is seen in the fairy rings:—to wit, the abstraction of nourishment by the plants from the parts beyond where they actually grow. The effects upon the skin of such an abstraction of nourishment would doubtless be to excite some degree of inflammation in it, by stimulating it to increased action; and this would manifest itself by a reddened appearance.

When two or more circles of tinea meet, they do not cross or continue themselves into each other; but, coalescing, they form, in the first instance, a sort of honey-combed appearance; and, by and by, the reticulations having disappeared, there remains one large and undivided figure. To this peculiarity the fairy rings present an exact parallel, as has already been noticed in the general description of these formations.

The circles of ringworm may, at first sight, appear to differ very materially from the fairy rings, in the circumstance, that whilst the latter merely form rings, the appearances in the former extend throughout the whole circular space. This, however, probably appears to affect the integrity of the analogy, I am at present endeavouring to draw, to a greater extent at first sight, than it really proves to do after consideration. The cause of difference will be found to lie chiefly in the diversity between the two sorts of plants—of the mushrooms in the fairy rings, and of the mycodermata in the ringworms. Every one is familiar with the appearance of a mushroom; and I need scarcely recal to mind, that it springs perpendicularly from the soil, and consists of a stalk surmounted by an expanded head. It is very different, however, with the mycodermata of tinea. These consist, as has already been stated, of jointed, slender filaments, whose chief direction of growth is lengthwise, and whose breadth bears a very small proportion to their length. They, therefore, resemble creeping plants in some respects much more nearly than mushrooms, or any of the other fungi which are connected with the fairy rings. If some creeping plant be conceived to take the place of the mushrooms in the fairy rings, and to be capable of producing analogous formations,

an appearance would be presented very unlike that of the fairy rings, and one which, in all probability, would be more comparable to the *tinea favosa*, so far as regards the point I am at present considering; for the long branches of the plants, as they proceeded from the centre, would be left behind; and the general mass would have the appearance of a circle, filled throughout its whole space with branches, radiating from the circumference towards the centre, after the manner somewhat of the spokes of a wheel, and very similar to what has been described as seen in the *tinea favosa*. Yet, though the whole appearance of such a growth would be most unlike to a fairy ring, the essential features of both would be identical, and the two would be strictly analogous. So is it in the case of ringworm. The mycodermata spring from the circumference of the circle, and, radiating inwards, fill up the interior space—obstructing the growth of the hair, (though the hair is not to be regarded as analogous to the grass in fairy rings,) and affecting the health of the skin.

I had intended, before concluding this communication, to advert to a chemical analysis of the scales of *tinea favosa*, made by M. Thenard, which is given in a short history and general account of the vegetable growths occurring on animals, by Mr Busk, published in the Microscopical Journal for 1841. It appeared to me not improbable, that the chemical composition of the mycodermata, and of their products, might bear some relation to that of the hair; which, by throwing light upon their origin and nature, might indicate some principles of treatment. On consideration, however, it seemed to me, that a chemical analysis of the crusts could scarcely guide us to any conclusion; for these consist of epidermis and other matters, in greater quantity than of mycodermata; and no knowledge, therefore, as to the composition of the mycodermata, could be derived from a knowledge of the composition of the scales.

ART. V.—*Case of Excrescences of the Anus, with remarks.* By  
WILLIAM TAIT, Surgeon, Glasgow.

Mr M. J., aged 51, of robust habit of body, and bilious temperament, first consulted me in the autumn of 1842, for what he called a prolapsus of the bowel. Being aware from my previous acquaintance with him that he was of a reserved disposition, I did not at this time make particular inquiries into the nature of his complaint, but contented myself by prescribing for him some slight purgative medicines, and a preparation of iron, in the form of the muriated tincture, with some astringent ointment to anoint the swelling before pushing it up after stool, which he was in the habit of do-

ing. From the regular use of these for a period of about seven or eight months, he expressed himself much relieved. But if his medicines were in any way neglected, or his stomach and bowels deranged from any excess of diet or unusual indulgence, his complaints were sure to return.

In the beginning of November 1844 he sent for me one forenoon rather hurriedly, and on visiting him I found him in great alarm and severe suffering. He stated to me that about eight in the morning he had been at stool; that the prolapsus had come down; and since that time till just now, being half-past eleven o'clock, he had been quite unable to push it back. On examination I found, protruding from the extremity of the gut, a large compact swelling about the size of a pretty large orange, of a shining, red, inflamed, irregular appearance, painful to the touch, and by no means unlike an inversion of the intestines. With the thumbs of both hands I endeavoured to push it up; but from the great pain which this attempt caused him, I found it necessary to desist. The bowels being constipated, I immediately prescribed for him some calomel and rhubarb, and ordered the swelling to be covered with a large lintseed meal poultice. On visiting him in the evening his medicine had operated freely; and on re-examination I found that the swelling had been reduced, and separated itself into large fleshy tumours or excrescences, varying in size from a field bean to that of a large walnut, with cartilaginous bottoms growing from the verge, and some of the largest retreating within the anus for about half an inch; two or three of them of the form of the last phalanx of the little finger, feeling like a piece of whip-cord. The alarming state into which he was thrown by this attack brought from him at this visit the following statement.

In the year 1817, without being preceded by any particular cause, after a long journey, something came down when at stool, but disappeared after using a hot bath. Three or four years afterwards, several warty bodies made their appearance, discharging a considerable quantity of matter, staining his dress, and for which he was obliged to consult a surgeon in this city, who designated them of a scirrhus character; but from some prescriptions which he gave him the discharge ceased. The warts or tumours, however, continued gradually to increase in size till 1830, when his bowels became very irregular. In 1837, he began to be attacked with paroxysms of colic impeding respiration, and had ten of these attacks, followed by jaundice, up to the date of November 1844. In one of these the jaundice continued for a period of two months, during which he was attended by another surgeon, who, not being made aware of the cause of his complaint, treated him as any ordinary case. Before and after this attack, he had acute pain in discharging his stools; and for hours before the regular period came round, he used to look forward to it as a severe task.



The pain which he had to encounter; the time, sometimes half an hour, which he had to take in order to return some of the tumours to give him relief, and the irritation continuing several hours afterwards, along with miserable feelings, made his case peculiarly distressing.

The gradual increase of the tumours to their present size, which was so considerable as almost to block up the gut, and consequently to interfere with the peristaltic motion of the intestines, causing irregularity by their alternately becoming loose and costive, with the great pain and irritation thereby induced, and the ultimate fear that their function might be entirely suspended by the speedy increase of the tumours, rendered it necessary that something should be immediately done for his relief. A consultation was proposed, but to that he seemed much averse; and after bringing his bowels into a tolerable condition, I decided on removing the tumours seriatim, beginning with the smallest by the use of the ligature and cauterizing with the *potassa fusa*. Four days after this visit with an instrument in the form of a tenaculum, but flattened and sharp at the edges, tapering gradually to a point, with a hole three or four lines from its point, through which was passed a double ligature of strong linen thread well waxed, I tied two of the smallest in the following manner. By placing the patient with his knees on the ground, the chest and abdomen resting on the front of a chair, his breach presenting, I, for want of assistance, got him to keep the nates separate with both hands, while, with the instrument, I transfixed one of them at its basis, and then withdrawing it, leaving the double ligature, with which I tied one-half of the root and then the other. The second one was transfixed and tied in a similar manner. The tying gave him much pain, which continued for some considerable time afterwards. In the meantime I enjoined confinement to bed, and the recumbent posture with the use of the lintseed meal poultices, which he was still using.

In the course of five or six days the deligated portions of the tumours had shrunk and sloughed off, leaving the hard cartilaginous bases already mentioned; but after several touches with the *potassa fusa*, which produced at the time of its application considerable pain, these entirely disappeared. As soon as the parts were healed, I began to treat in the same manner other two situate externally, and attended with similar results.

The complete removal of these tumours gave him considerable relief. As his health was in some measure impaired from close confinement and the treatment he was undergoing, I thought it proper to delay for some time, and ordered him to the country to recruit, before proceeding with the remainder, four in number, situate within the anus. It became here to be a question what would be the easiest method to get at them? As it has been al-

ready mentioned, when he was at stool the whole came down, it appeared evident that, by prescribing for him some slight purgative, an hour or two before operating, they would be brought into a position that might enable me to lay hold of them. After the interval of about three weeks I again proceeded, after the prescription of a seidlitz powder, which in its operation brought the whole of them into view, although their necks and roots still retreated within the anus, three of them of a red fleshy appearance, about the size of ordinary sized walnuts, and the fourth fully one inch in length. By the instrument I could easily lay hold of the largest, which was tied. The pain, though considerable, was not by any means to be compared with the tying of the external ones. In a few days, like the others, it had shrunk and sloughed off. The other three were successively tied, and came away in a similar manner, no caustic being used.

The troublesome symptoms had now entirely disappeared, and in about six weeks from the tying of the last one the patient had entirely recovered. The sphincter muscle, which had been dilated by the mass, had not recovered its tone and action. On the 7th of July 1845, I had an interview with Mr J., and he then expressed himself completely well. The sphincter is now acting sufficiently; and although his bowels have occasionally got costive since the operations, they are not attended with the inconvenience as formerly. He also expresses himself greatly improved in strength, and is in better health than he has enjoyed for a number of years. His general appearance is now, when I write, in the middle of May 1846, that of a person in robust health.

*Remarks.*—After the lapse of fifteen months, since the last operation, I have conceived it proper to submit the above case to the profession; and although it may be common for some practitioners to have similar cases, yet, from the formidable nature of this case, brought on, as it appears to me, in a great measure from neglect, the peculiarity of the symptoms induced in such a position, has made me venture to offer a remark or two upon them.

It will be observed that the attacks of jaundice which generally showed themselves at the period of the paroxysms, and which were treated as any ordinary case arising, as might readily occur, from obstruction in the hepatic ducts, the patient not making his medical attendant aware of his complaint; but when he relates his state and case from the beginning, it is seen the jaundice arose from quite a different cause. We do not know what may have been the state of the bile and biliary ducts during the attacks; but we have strong reason to infer, that whatever may have been their condition, these must have been influenced by the peristaltic motion of the bowels being incommoded, and con-

sequent regurgitation of the stools, by these swellings at the extremity of the gut thereby, in a manner sympathetically, and even directly, acting upon them. It will be observed, that whenever the bowels got into a state of extreme irregularity, an attack of colic, followed by jaundice, was certain to occur. Now, after the lapse of fifteen months, which time I have purposely allowed to transpire, before venturing to give any opinion, it is seen that all these symptoms have been entirely overcome, and the patient's health completely re-established.

With regard to the treatment employed, some may object to its severity. But when I have the distinguished authority of Sir A. Cooper, in his lectures, for stating that excrescences at the anus are of a very vascular character, and that the employment of the knife or scissors has been attended with at least four fatal results, in his own practice, the warning which he consequently gives against their use, and the strong opinion given in favour of the ligature, form sufficient reasons for its employment.

The *potassa fusa* may also be objected to as being by far too powerful an application to such a sensitive part as the anus, and in weak and irritable constitutions more particularly, I would hesitate very much in employing it. But in this case the hard cartilaginous nature of some of the excrescences demanded its use. Nitrate of silver, even repeatedly applied, would have produced little or no effect upon them; but the active nature of the other, although attended with great momentary suffering, answered the purpose efficiently and expeditiously, without subjecting the patient to the frequent use of an inefficacious remedy.

*Stockwell Place, Glasgow,*

*May 1846.*

ART. VI.—*Surgical Cases, with Observations.* By DAVID KERR, M. D. Lecturer on Surgery in the University and King's College, Aberdeen.

## No. II.

1. *Lithotomy; death from hemorrhage on the fifth day, proceeding from an abnormal distribution of arteries.*

It is, I believe, but too common with medical men to give to the public those cases in which they have been successful, while the unsuccessful cases, which might be arrayed against them, are consigned to oblivion. This practice, although it may serve to advance the interests of the practitioner, has a prejudicial effect on the profession to which he belongs, tending to mislead us in our estimate of particular modes of practice, and completely setting at defiance any approximation to truth

in our statistics. This is especially the case, when medical men select for publication a particular part of their experience, while other portions in the same department, which might tell less favourably, are withheld. Under this impression it has appeared to me, that the following case, although it must be ranked as unfortunate, may be found more interesting than a detail of those in which I have been successful; sustaining, as these do, an average not below what has been obtained by the great majority of lithotomists.

W. K. a healthy-looking man, about 60 years of age, applied to me, on the 14th of December 1840, for advice regarding symptoms indicative of stone in the bladder. On introducing the sound I readily detected a calculus. In this case the uric acid diathesis prevailed, alkaline remedies were therefore prescribed, and other medicines calculated to improve the condition of the digestive organs, and to allay irritability. By these means partial but temporary relief was procured. After a time the symptoms increased in severity, and ultimately became so urgent, that he repaired to Aberdeen on the 12th April 1841, for the purpose of having the stone removed. He was subjected to preparatory treatment till the 1st of May, when the operation of lithotomy was performed in the usual manner.

The first incision was commenced not more than one inch and a quarter anterior to the anus, to the left of the raphe, and carried obliquely backwards to the extent of three inches between the anus and tuberosity of the ischium, but nearer to the latter than the former. The membranous portion of the urethra being exposed, was opened with the scalpel, and the section of the prostate gland made with a probe-pointed knife. The forefinger of the left hand being introduced through the wound, and the stone felt, the staff was withdrawn, and the forceps guided into the bladder by the finger. But as the stone was not readily grasped, the operation was rather tedious, occupying a period of nearly seven minutes, as measured by the watch of one of those gentlemen who estimate the excellence of an operation by the number of minutes, which have been occupied in its performance.

The calculus, which was composed of uric acid, measured one inch and a half in length, fully more than one inch in breadth, and something more than half-an inch in thickness. It weighed three drachms, and is by much the smallest solitary calculus I have had occasion to remove, unless in young subjects.

The only other circumstance connected with the operation requiring notice, and indeed the only one worthy of remark, was the hemorrhage which took place. The flow of arterial blood, although not alarming, was more profuse than what I

have witnessed in any previous or subsequent operation, and appeared to come from the upper part of the wound. Every precaution, however, had been taken to avoid wounding the artery of the bulb, by making the incisions low down in the perineum. The perineum being deep the bleeding vessel could not be discovered, and as the hemorrhage ceased spontaneously, soon after the removal of the stone, a gum-elastic tube was introduced through the wound into the bladder, and the patient put to bed. There was no further oozing of blood than what is common in cases of lithotomy, nor was the urine which flowed after the operation more than usually tinged.

On the morning of the second day the patient expressed himself as having passed a good night ; indeed he looked quite comfortable, and had slept during a great part of the night ; and up to the evening of the fourth day, to use his own expression, he continued to eat and to sleep as usual. During the fourth day the urine flowed partly through the natural channel, and partly through the tube, which was not removed till the evening of that day, having been allowed to remain thus long in consequence of the free hæmorrhage which occurred during the operation. Till this period, the case had proceeded in the most satisfactory manner, and I entertained the conviction that every danger had now been surmounted, and that the wound, which already seemed disposed to unite, would soon heal up. In this, however, I was sadly disappointed.

On the morning of the fifth day, I found he had passed an uncomfortable night, with occasional calls to void his urine, which now flowed altogether *per urethram*, and seemed slightly tinged with blood ; and the pulse, which had all along been good, and never above the natural standard in frequency, had now risen to 90. In this unsatisfactory state I left my patient at 10 o'clock A. M., with the intention of soon revisiting him ; but in the short space of one hour I was hurriedly called, and was mortified to find that the case which, twelve hours before, was proceeding most favourably, and promised a speedy recovery, was now, to all appearance, beyond the reach of our art. The patient presented the aspect of a man sunk from loss of blood. His countenance was pale and ghastly, and covered with a cold perspiration ; his pulse a mere thread, and rapid. The desire to void his urine was now incessant, but nothing passed unless small clots of blood. There was no bleeding from the wound, which externally had closed ; but the bladder could be felt extending half way between the pubes and umbilicus, evidently distended by internal hemorrhage. I immediately opened up the wound, already rather firmly united in the more superficial parts, and arterial blood issued in abundance. A ca-

nula wrapt round with lint was firmly inserted into the wound, with the twofold view of compressing the bleeding vessel, and of affording an outlet from the bladder. By compression thus employed, the bleeding seemed to be arrested, for no farther hemorrhage appeared from the wound. But the internal loss of blood was so tremendous, that no attempt could be made to wash out the bladder; and the patient sunk, notwithstanding the exhibition of the strongest stimulants, and died in the course of a few hours.

In this case, the early closure of the superficial parts of the wound, after the removal of the tube, prevented the hemorrhage from appearing externally, and the escape of the vital fluid into the bladder threw the attendants off their guard, until the symptoms became too alarming to be mistaken. Anxious to learn the source of this sudden and unexpected event, I requested my colleague, Dr Andrew Moir, then teacher of anatomy in the University, to make an inspection of the body.

On a careful dissection of the perineum, it appeared that the rectum and pudic artery, usually regarded as the Scylla and Charybdis of lithotomists, were safe,—that the bulb of the urethra was untouched,—that the membranous portion had been opened immediately in front of the prostate,—and that this latter body had not been completely divided. The strongest advocate of a small internal incision could not have wished the section of the prostate different. On opening the bladder, it was found to contain an immense quantity of coagulated blood, amounting to several pounds. There was no other morbid state of the parts implicated in the operation.

What, then, was the cause of hemorrhage? It proceeded from a variety in the arteries of the perineum. The artery of the bulb, and the transverse artery of the perineum, came off from the pudic by a common trunk, which soon divided, and the former (the artery of the bulb) being much lower down, or farther back in the perineum than usual, traversed the line of incision, and was, of course, divided along with the transverse artery. But how did it come to pass that a vessel of such magnitude as the artery of the bulb, a wound of which is nearly as much dreaded by lithotomists as that of the pudic itself, did not continue to pour out blood when divided? I can only reply, by supposing that, after the free hemorrhage which took place during the operation, the force of the circulation had been so far enfeebled (although the system seemed scarcely to feel the loss), that a coagulum of blood had formed, and come to press upon the bleeding vessel, and had thus arrested the hemorrhage *pro tempore*; but this coagulum being disturbed at the end of the fourth day, by the removal of the tube, and afterwards dissolved by the urine coming in contact with it, while

the permanent process for securing the vessel was yet incomplete, gave rise to the insidious and fatal hemorrhage into the bladder. There is every reason to believe that, if the tube had been allowed to remain a few days longer, the case would have had a favourable termination; for no one ever proceeded more to the satisfaction of the operator than this did, till the evening of the fourth day.

I may conclude the brief history of this unfortunate case with a quotation from a surgeon of high standing, and deserved reputation in the profession. Speaking of hemorrhage after lithotomy as frequently resulting from an abnormal distribution of arteries, Professor Porter observes, "These and similar misfortunes cannot be avoided, and when they occur, scarcely admit of relief; and that they may fall out in the practice of any man, however careful, may be inferred from the following passage, which, resting on the testimony of Baron Boyer, offers a rather appalling picture of the dangers of lithotomy, while it may well console any surgeon who loses a patient under such circumstances. 'Hemorrhage is one of the most common accidents attendant on lithotomy, and has often been laid to the account of the operator, or the particular operation he selected; but contrary to all justice; for the arteries of the perineum present such varieties, both in situation and in their course, that the most dexterous surgeon cannot be certain of avoiding them, no matter what operation he may perform.'"

2. *Case of Excision of a portion of the lower Jaw for a fungoid Tumour, springing from the interior of the bone, with its subsequent history.*

It is gratifying to look over the history of surgery, and trace the progressive improvements made in this department of medical science. When we compare the frequency with which operation was had recourse to in former days, with the rareness with which, in many cases, it is now recommended, the difference is at once obvious and striking. It is certain that for one amputation performed now for affections of the joints, six or seven might have been witnessed in former times. This improvement has, doubtless, taken its rise, partly from more intimate acquaintance with the powers of nature in the repair of injury and disease, partly from an improved diagnosis, and the employment of more scientific treatment, and in some measure, perhaps, from reluctance on the part of well informed surgeons, at least, to perform unprofitable operations.

But however it may be with amputation, strictly so called, it may be doubted whether operative procedure be abstained from in many instances, wherein experience should have long

since attested its entire worthlessness. Such I believe to be the case with *fungus medullaris*. I have never known a case of this disease operated on, in which it did not return; and I am not aware that there is to be found on record a single well attested instance of this affection, where operation had been resorted to, even to the extent of removing an entire organ or limb, in which the malady did not reappear and destroy its victim, generally within the year, and often in a shorter period. For my own part, I consider this disease so entirely constitutional, that no local means can exert any influence over it; and as there is no known medicine that can even retard its progress, it must, in the strictest sense of the word, be termed malignant. Of the truth of this statement, the case to be related affords another melancholy proof, if such were needed.

Mrs ——— came to Aberdeen in the summer of 1843, for the purpose of having a tumour removed from the right side of the lower jaw. I saw this lady for the first time on the 30th August. She was in her 36th year, tall, and of robust make, about five months advanced in her eighth pregnancy, and of a peculiarly sallow and unhealthy complexion. In the previous February she discovered a small swelling about the size of a pea, situated on the outer side of the gum, opposite the small molars of the right side of the lower jaw. This gradually increased in size, and in June had acquired fully the bulk of a hazel nut, being irregular on the surface, and unattended with pain. On the 30th June it was punctured with a lancet, and blood alone escaped. The swelling still preserved its size, and the puncture healed up in a few days. On the 7th July it was laid open through its whole extent, and the *tinctura ferri muriatis* freely applied, but with no other effect than that of stimulating the fungus which sprung up from the interior of the tumour, and extended forwards and backwards, until it reached the posterior molar behind, and the lateral incisor in front, displacing four of the teeth, the anterior molars, the canine, and lateral incisor, and pushing them inwards upon the tongue. The fungus continued to increase, and was partially removed with the knife on the 23d July, and caustic potass was applied. The growth of the tumour, however, was more rapid than before, and at the time I first saw the case, on the 30th August, it had acquired a size larger than a pigeon's egg.

The history of this case, and the state of pregnancy, but, above all, the peculiar unhealthy appearance of the patient, led me to give an opinion unfavourable to operation; but my patient and her friends became urgent, and I consented with reluctance to undertake the removal of the diseased part, which was effected on the 8th September. An incision was made in



the mesial line, and joined at its lower end by a horizontal incision along the base of the jaw on the right side. The flap thus formed was reflected, and the soft parts detached from the inside by running the knife along the bone. A small groove was then made at the symphysis by the saw, and the bone divided by the cutting pliers, which, without assistance, readily divided it also behind close to the *ramus*; and thus a portion of bone, between two and three inches in length, expanded into a shell, and containing the tumour, was removed in a few seconds. In this case injury of the facial artery was avoided, by reflecting it in the flap, and pushing it backwards. A profuse hæmorrhage from numerous small vessels took place, but soon subsided on the application of cold. A small piece of lint was introduced into the wound, and the flap was adjusted, and retained *in situ* by stitches, supported by slips of plaster, and covered by a few turns of bandage. Adhesion took place along the whole line of incision, except near the posterior extremity, where the saliva continued to flow for a short time; but on the 18th the union was complete; and on the 23d, fourteen days after operation, my patient left Aberdeen with the wound so accurately united, that an ordinary observer would not have discovered, that she had been the subject of so formidable an operation.

As far, then, as the immediate effect of my operation was concerned, it was attended with the most complete success. But the opinion I had given was fully borne out by the subsequent history of the case. After being delivered of a still-born child, near the full time, her health soon broke up. Although the disease did not reappear in the jaw, it developed itself in other parts of the system; and in less than six months she fell a sacrifice to her dreadful malady. Such, I am fully satisfied, will be found to be the history of every case of *fungus medullaris*. The profession are duly informed of the results of operations when attended with apparent success; but we are commonly left in the dark as regards the subsequent history of such cases; and, until furnished with a faithful record of their subsequent history, our statistical records, touching the value of operations, must be almost, if not altogether, worthless.

*Aberdeen, December 1846.*

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ART. VII.—*The Consciousness of Right and Wrong a just test of the plea of Partial Insanity in Criminal Cases, illustrated by the case of William Stalker, indicted at the Cumberland Lent Assizes, 1847, for the wilful murder of his wife.* By

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UNDER the term partial insanity, as opposed to idiocy and dementia on the one hand, and to mania on the other, are included three varieties of mental disorder,—monomania, moral insanity, instinctive insanity.

The law respecting crime charged as having been committed by persons labouring under any of these varieties of mental disease is clearly laid down in the answers given by the fifteen judges to the questions proposed to them by the House of Lords in June 1848.

*“ Question I.—*What is the law respecting alleged crimes committed by persons afflicted with insane delusion in respect of one or more particular subjects or persons, as, for instance, when, at the time of the commission of the alleged crime, the accused knew he was acting contrary to law, but did the act complained of with the view, under the influence of some insane delusion, of redressing or avenging some supposed grievance or injury, or of producing some supposed public benefit ?” *Answer.—*“ The opinion of the judges was, that, notwithstanding the party committed a wrong act while labouring under the idea that he was redressing a supposed grievance or injury, or under the impression of obtaining some public or private benefit, he was liable to punishment.”

*Question II.—*“ What are the proper questions to be submitted to the jury, when a person alleged to be affected with insane delusion, respecting one or more particular subjects or persons, is charged with the commission of a crime, murder for example, and insanity is set up as a defence ?” *Answer.—*“ The jury ought in all cases to be told that every man should be considered of sane mind until the contrary were clearly proved in evidence ;—that before a plea of insanity should be allowed, undoubted evidence ought to be adduced that the accused was of diseased mind, and that at the time he committed the act he was not conscious of right and wrong. This opinion related to every case in which a party was charged with an illegal act, and a plea of insanity was set up. Every person was supposed to know what the law was, and therefore nothing could justify a wrong act, except it was clearly proved that the party did not know right from wrong. If it was not satisfactorily proved, the accused was liable to punishment ; and it was the duty of the judge so to tell the jury when summing up the evidence, accompanied by those remarks and observations which the nature and peculiarities of each case might suggest and require.”

*Question III.—*“ In what terms ought the question to be left

to the jury as to the prisoner's state of mind at the time when the act was committed?" No answer.

*Question IV.*—"If a person, under an insane delusion as to existing facts, commits an offence in consequence thereof, is he hereby excused?" *Answer.*—"If the delusion were only partial, the party accused was equally liable with a person of sane mind. If the accused killed another in self-defence, he would be entitled to an acquittal; but if the crime were committed for any supposed injury, he would then be liable to the punishment awarded by the laws to his crime."\*

The existence or non-existence of the consciousness of right and wrong in the mind of the person at the time of committing a criminal act is therefore the only test of the plea of partial insanity recognised by the law of England.

Theoretically, this test is admitted to be just and reasonable. But considerable difficulty is experienced in practically applying it to numerous cases; and this appears to arise, *1st*, from the erroneous opinions frequently entertained as to the nature of partial insanity; and, *2dly*, from attempts to apply the test to the third variety of partial insanity, denominated "instinctive insanity."

To the two first varieties, monomania and moral insanity, (which include the majority of cases in which the plea of partial insanity is raised,) it will be found that the test given by the fifteen judges above stated is completely applicable; that by means of it crime and injuries unconsciously, and therefore innocently committed, may be best distinguished, and the ends of justice and humanity alike promoted.

The existence of instinctive insanity is not recognised by the law.

A consideration of these three varieties of mental disease, monomania, moral insanity, and instinctive insanity, will best illustrate these remarks.

*1stly, MONOMANIA, OR PARTIAL DERANGEMENT OF THE UNDERSTANDING.*—This disease is characterised by the presence of an intellectual delusion or hallucination,† leading naturally to false deductions, and therefore to insane conduct in matters connected with some particular false idea. On subjects unconnected with the erroneous impression, a person so affected betrays in conversation no symptoms of mental disease. Dr Conolly entertains the opinion that, in a large proportion of cases of monomania, the disease is thus limited, and advocates at some length‡ the doctrine, that, where the disorder is so limited, "no possible right can exist

\* Quoted by Dr Guy. *Principles of Forensic Medicine*, p. 259. London, 1844.

† A *delusion* is defined by Dr Browne (Report of the Crichton Institution, &c. 1846), to be the result of real external sensations, as where a friend is mistaken for a stranger and an enemy; a *hallucination* to be the product of the mind, as where a man fancies himself possessed of immense wealth, to be a prophet, &c. &c.

‡ An Inquiry concerning the Indications of Insanity. London, 1830.

to interfere with or imprison any man so afflicted," who, therefore, if fit to be at large, is, notwithstanding his delusion, a responsible moral agent. While I cordially concur with Dr Connolly in the opinion, that what we have to determine in any case of monomania is, "whether the degree or character of the disturbance is such as to make the patient dangerous to himself or others, either as regards persons or property," (p. 386), I consider, with Dr Prichard,\* "that, although cases are indeed on record which, if faithfully related, fully come up to the description, (viz. that the delusion constitutes the entire disease); yet that in general the real character of monomania is very different:" with Dr Davy,† "that the several assumed personifications of monomaniacs must be regarded only as a morbid colouring to their several deranged moral feelings;" with Georget,‡ "that patients who are insane on one point only, more or less limited, may have experienced some severe moral disorders, which influence the conduct and actions of the individual, without materially injuring his judgment."

A further examination of the morbid phenomena of this disease will show, that, in the majority of cases, there are present a series of delusions rather than a single one, having reference to the patient himself, as his wealth, his friends, his importance; and that, though the intellect is sound, except in regard to these particular delusions; though the patient can on other subjects converse rationally and argue reasonably; yet there generally exists a diseased state of the moral principle or conscience,—that power which regulates the exercise of the desires and affections, (as does the reason or judgment the exercise of the intellect)—evinced by morbid perversion of one or more of the desires or affections, which perversion existed prior to the manifestation of any intellectual disorder; and further, that the monomania is in connection with the particular moral feeling diseased. Thus a person conceives an ungrounded dislike to his nearest relations; he becomes suspicious, morose, and unfriendly. At length he imagines that they have formed a plot against his life; he becomes a monomaniac. It is, however, evident that the delusion is but the progress of disease in a mind already disordered.

The testimony of the authors I have just quoted, in support of the view that the primary disorder in monomania is disease of the moral principle, the loss of consciousness of right and wrong, as evinced by morbid perversion of one or more of the moral feel-

\* A Treatise on Insanity, &c. p. 27. London, 1835.

† Medico-Legal Reflections, &c. p. 35. London, 1843.

‡ Discussion Medico-Legale sur la Folie, ou Alienation Mentale, suivie de l'Examen du Procès Criminel de Henriette Cornier et de plusieurs autres Procès dans lesquels cette Maladie a été alléguée comme moyen de défense. Paris, 1826. 8vo. And Ray's Treatise on the Medical Jurisprudence of Insanity, p. 171. Edinburgh, 1839.

ings, is corroborated by an analysis of the progress of the healthy mind to intellectual misgivings and doubts as to the truth of Divine revelation. "An inquiry," says Dr Abercrombie,\* "of much importance is to mark the process by which, in individual instances, conscience, the power which conveys to man a certain conviction of what is morally right and wrong, in regard to conduct in individual cases, and the general exercise of the desires and affections, ceases to be the regulating principle of the character. . . . Take, for example, the operation of the truths relating to the character and perfections of the Deity. . . . Firstly, the mind is not directed with due care to these truths, and the natural result is a corresponding deficiency in the emotions and conduct which ought to flow from them. This will be the case in a still higher degree, if there has been formed any actual derangement of the moral condition, if deeds have been committed, or even desires cherished by which the indications of conscience have been violated. The moral harmony of the mind is then lost, and, however slight may be the first impression, a morbid influence has begun to operate in the mental economy. . . . The truths connected with the Divine perfections are now neither invited nor cherished; but are felt to be intruders which disturb the mental tranquillity. The attention ceases to be directed to them, and the corresponding emotions vanish from the mind. . . . When the moral harmony of the mind has been impaired to this extent, another mental condition arises, which consists in a distortion of the understanding itself, regarding the first great principles of moral truth. For a fearless contemplation of the truth respecting the Divine perfections having become inconsistent with the moral condition of the mind, there next arises a desire to discover a view of them more in accordance with its own feelings. This is followed in due course by a corresponding train of its own speculations, and these by a mind so prepared are received as truth. The inventions of the mind thus become the regulating principles of its emotions."

And so in monomania is the supervention of intellectual delusions preceded by disease of the moral principle, by loss of the consciousness of right and wrong, evinced by perversion of the moral feelings. "If we advert," says Dr Prichard,† "to the order and connection of morbid phenomena, we often learn that on a settled and habitual melancholy, or on a morose and sullen misanthropy long growing and indulged, or on some other disordered and perverted state of the feelings and affections, a particular delusion has more recently supervened. An individual of melancholic temperament, who has long been under the influence of circumstances calculated to impair his health, and call into play the morbid tendencies of his constitution, sustains some unex-

\* *The Philosophy of the Moral Feelings*, p. 156. London, 1833.

† *Op. cit.* p. 22.

pected misfortune, or is subjected to causes of anxiety ; he becomes dejected in spirits, desponds, broods over his feelings till all the prospects of life appear to him dark and comfortless. His inclinations are now so altered, that no motive has sufficient influence over him to rouse him to voluntary and cheerful exertion. During this period, if questioned as to the causes of his mental dejection, he will probably assign no particular reason for it. At length his gloom and despondency becoming more and more intense, his imagination fixes upon some particular circumstance of a distressing nature, and this becomes afterwards the focus round which the feelings which harass him concentrate themselves. This circumstance is often real ; occasionally some trifling act of delinquency, for which the individual expresses the strongest and perhaps disproportionate self-condemnation. In other instances, an unusual phantom suggests itself in harmony with the prevalent tone of the feelings, which at first haunts the mind as possible, and is at length admitted as reality. Other individuals begin by indulging morose and unfriendly sentiments towards all their acquaintance, magnifying in imagination every trifling neglect into a grievous contumely. They fancy at length that they find in some casual occurrences glaring proofs of premeditated designs to ruin them, and expose them to the contempt and derision of society. The disease in these cases has its real commencement long before the period when the particular delusion, which is only an accessory symptom, is discovered, and even before it became impressed on the imagination ; but it is not until that impression has taken place that the case assumes the proper character of monomania."

That the order and succession of morbid phenomena in the progress of this disease is really such as has just been described, is well illustrated by the following case, in which morbid perversion of the moral feelings (depending on disease of the moral principle, of the consciousness of right and wrong,) preceded the supervention of intellectual delusions, and led to the commission of murder.

*A Case of Monomania preceded and accompanied by perversion of the moral feelings leading to the commission of murder ; acquitted on the plea of unconsciousness of right and wrong.*

William Stalker, aged 41, a farmer, was admitted into the Cumberland Lunatic Asylum at Dunston Lodge, on the 28th of February 1846.

From his history it would appear that 18 months prior to this date he had become unsettled and inattentive to his affairs.

This state of mind was at the time attributed by his friends to disappointment with regard to a will.

He became gradually more and more unsettled, and, though formerly of sober habits, took to drinking. He next conceived an ungrounded dislike to various members of his family, and used threatening language to those of his acquaintance who happened to offend him. On several occasions he threatened the life of his medical attendant.

Undoubted evidence exists, that a few days before his removal to the asylum, he had purchased arsenic and mingled it with food preparing for the farm servants, several of whom, as also his wife, had symptoms of irritant poisoning; while the presence of arsenic was chemically detected in the matter vomited.

On admission, his manner was calm and collected, he answered questions rationally and civilly, and expressed extreme surprise at being sent to a lunatic asylum. He denied the whole affair of the poisoning.

His tongue was furred; bowels costive; face flushed; vessels of sclerotic and conjunctiva injected; increased action of the temporal arteries; cephalalgia. These symptoms were in a few days relieved by active antiphlogistic measures.

After repeated careful investigation, my colleague, Mr Furness of Newcastle and I failed in detecting any lesion of the intellect. He appeared, however, to be a man of naturally weak mind. He muttered a good deal to himself in walking in the airing ground.

His conduct during the entire period of his residence in the asylum was orderly. He worked daily on the farm, and expressed his willingness to adopt any remedies which might be recommended.

He never spoke about his friends, nor did he express any anxiety to be discharged.

He continued without any alteration until the 26th of July, when, in opposition to the united opinion of the medical officers and superintendent of the institution, he was removed by his wife.

On his return home he conducted himself in the same strange unsettled manner he had done before his removal to Dunston. He again resumed the use of ardent spirits, and used threatening language to all who appeared to him to have offended him.

He further conceived an ungrounded jealousy against a most respectable man, who had made honourable proposals to his daughter.

In November he began to exhibit hallucinations. He stated "that he would be the death of his medical adviser, as that gentleman had vomited the devil into his (Stalker's) mouth and nearly choked him."

On the 29th of December, he returned at 4 P. M. from market, slightly intoxicated, to his house in the village of Caldbeck, and then went to the adjoining farm in search of his wife.

At 10 p. m. his son returned from Carlisle, and not finding his parents at home, proceeded to the farm-house, and on entering discovered the body of his mother lying dead upon the floor.

A coroner's inquest was held the following day. The deceased was proved to have died by strangulation, and a verdict of "wilful murder" was returned against Stalker.

Search was then made for him, but without effect.

The following morning he was found concealed in a holly bush three-quarters of a mile from his own farm. He attempted to make his escape, and when his pursuer was within three yards of him he turned, and being armed with a very large stick, threatened to strike; but seeing other people coming up he surrendered, and smiling gave up his stick and said, "take it and knock me on the head, for I suppose that is what you want." He then added, "She struck at me with the poker, and I must stand up in my own defence; she might have killed me as easily as me kill her." Nothing had been said about his wife's death at this time.

He afterwards, without any solicitation, detailed the particulars of the murder, nor did he ever vary the story. He said, that on his return from the market he met the person already alluded to, with whom he suspected the deceased to be over friendly to; that the passion got into his eyes, and that it never more got out that night; that he and the deceased had tea together at the farm; that the conversation turned on his sister; that the deceased said she had had a bastard child, and that he (Stalker) then got up and "clicked her by the throat." He said that no matter who the person that had given him the provocation was, he would have done the same. He also said if he had not done it then, it might have been months, it might have been years, but he had it to do, and that he was not sorry for what he had done. He concluded by asking his hearers if they would not have done the same had they been in his situation?

He was indicted for murder at the Cumberland Lent Assizes held at Carlisle in February last.

On being informed by Baron Alderson that he stood charged with the wilful murder of his wife, he interrupted his Lordship, and, with a complacent smile, said, "Na, na, not wilful, not wilful, my Lord."

His Lordship first questioned several witnesses as to the prisoner's present state of mind, with a view to ascertain whether he was conscious of right and wrong, and capable of appreciating the responsibility of his position. The unanimous opinion was, that he was not. Baron Alderson then, in an able charge to the jury, explained, that if they considered the accused unfit to appreciate his position as a moral agent, responsible to the laws of God and man, he must be looked upon as likewise unfit to make his de-



fence, and therefore not in a state to stand his trial. The jury found the prisoner to be unconscious of right and wrong, and incapable of appreciating his position, and he was remanded until her Majesty's pleasure be known.

In a conversation which I had with Stalker the day before the trial, he exhibited several hallucinations; "that the devil had got into his eyes;" that while in the asylum, he had required "a wedge to be placed every night between his teeth, to prevent lock-jaw," &c. &c.

He seemed totally indifferent as to the issue of the trial, and expressed no regret at having committed the awful crime of which he was accused.

In this case there evidently supervened the result of a direct exciting cause, (disappointment,) morbid perversion of the moral principle, as evinced by the want of control exercised over the desires and affections.

First there was general unsettledness; next an insane dislike to those nearest and once dearest to him; then followed the attempt to poison a body of farm-servants with whom he had no cause of quarrel; then the dangerous threats with which he menaced all who in any way displeased him; then the unnatural jealousy of the betrothed of his deceased daughter, all terminating in the murder of his wife for the slight provocation of an angry word.

It is true he eluded pursuit; his intellect was so far sound that he theoretically knew the consequences of his wicked deed; but his former history, coupled with the insane mode in which he endeavoured to justify the act, appealing to his hearers "if they would not have acted the same part," as also his indifference (beyond the power of simulation,) as to the atrocity of the act or as to its consequences, all lead to the conclusion, and justified the opinion given by me at the trial, that the accused was deprived by disease of the consciousness of right and wrong, and, therefore, unable to appreciate the moral responsibility of his position.

Here, also, the supervention of intellectual delusions was preceded by disease of the moral principle, and monomania ran the course I have above endeavoured to point out it generally does, namely, that perverted action of the moral feelings is followed by intellectual delusions.

The second variety of partial insanity frequently discussed in courts is that termed by Dr Prichard, MORAL INSANITY. This disease consists in morbid perversion of the desires and affections (depending on disease of the moral principle or conscience, that power which conveys a certain conviction of what is right and wrong in regard to the exercise of the moral feelings,) unattended by disorder of the intellectual faculties. The existence of this

disorder has, since the publication of Dr Prichard's work, been recognised by all writers on mental disease; and indeed every asylum for the insane furnishes examples of it.

An analogous state of mind (though not leading to insane conduct,) is observed in persons reputed sane, but in whom the controlling influence of the moral principle or conscience has been neglected and become torpid or non-existent. "In such," says Dr Abercrombie,\* "self-love degenerates into low selfish gratification; the desires are indulged without any other restraint than that which arises from a mere selfish principle, as a regard to health, perhaps in some degree to reputation; the affections are exercised only in so far as similar principles impose a certain degree of attention to them; present and momentary impulses are acted upon without any regard to future results; conduct is adapted to present gratification, without the perception either of its moral aspect, or its consequences to the man himself as a responsible being, and without regard to the means by which these feelings are gratified. In all this violation of moral harmony there is no derangement of the ordinary exercise of judgment. In the most remarkable example that can be furnished by the history of human depravity, the man may be as acute as ever in the details of business or the pursuit of science. There is no diminution of his sound estimate of physical relations, for this is the province of reason. But there is a total derangement of his sense and approbation of moral relations, for this is conscience." And so in moral insanity we find the same loss of power of the moral principle evinced by disordered action of one or more of the desires or affections present, but diseased to such an extent as frequently to weaken the intellectual faculties, and always to unfit the sufferer for the discharge of the duties of life; his inability to appreciate moral guilt frequently rendering him a dangerous member of society. "The individual thus affected follows the bent of his inclinations; he is continually engaging in new pursuits, and soon relinquishing them without any other inducement than mere caprice and fickleness. At length the total perversion of his affections; the dislike, and, perhaps, even enmity manifested towards his dearest friends, excite great alarm." Persons labouring under this disorder are capable of reasoning or supporting an argument upon any subject within their sphere of knowledge that may be presented to them; and they often display great ingenuity in giving reasons for the eccentricities of their conduct, and, in accounting for and justifying the state of moral feeling under which they appear to exist. In one sense, indeed, their intellectual faculties may be termed unsound: they think and act under the influence of strongly excited feelings, and

\* *Op. cit.* p. 174

persons accounted sane, are, under such circumstances, proverbially liable to error both in judgment and conduct.” \*

“ The varieties of moral insanity are perhaps as numerous as the modifications of feeling or passion in the human mind.”\* A knowledge of the action of the healthy mind teaches us that the cause of these various manifestations is disease of the moral principle,—a want of power to appreciate right and wrong.

“ Notwithstanding,” says Ray,† “ the correctness of his conversation and his plausible reasons for his singular conduct, a strict scrutiny of the actions of a patient labouring under moral insanity, if not of his words, will convince us that his notions of right and wrong are obscured and perverted, and that his own social position is viewed through a medium which gives a false colouring to its whole aspect.”

The following case (the particulars of which are taken from a paper in the sixth number of the Edinburgh Law Journal,) illustrates the character of moral insanity, and is peculiarly suited to the present remarks, having been made the subject of a plea of insanity in a case of murder.

*Case of Moral Insanity, leading to the commission of Murder ;  
found guilty and executed.*

John Howison, aged 45, was tried in Edinburgh in 1831 for murder, and executed. Dr Prichard has pronounced his case “ to be a very characteristic one of moral insanity.” “ He fell,” he adds, “ a victim to ignorance.”

From the evidence adduced in court, it appears, that, some years previous to the date in question, Howison’s conduct, manner, and appearance had in no way differed from that of other men—that he had been sane.

He then became a silent, solitary, wandering, moody creature, his only friends a cat and a child, and he fed both before eating his own meal. He became superstitious, feared supernatural enemies, and resorted to absurd ceremonies to protect himself against witches, salting his bed and head, wearing about his waist or round his neck a Bible, which he never read, and attaching folded papers to his garments, and to the crown of his head, without which he often said he would long ago have been dead. He had a fancy to become a quaker, and attended the meetings of the persuasion some months, where he paid no attention to the worship, but muttered to himself, smelled his Bible, and pricked himself with pins or needles to the effusion of his blood. He demanded instant admission to the Society on one occasion, and with violence. He went more than once to the meeting-house early in the morning, and was seen to kneel, and heard to invoke the Virgin Mary,

\* Prichard, Op. cit. p. 13, &c.

† Op. cit. p. 175.

while he wounded himself on both hands, and smeared the doors with his blood.

Farther, he had an incredible appetite, eat his food raw and dirty, and sucked the blood from his own wrist after every two or three mouthfuls of his food. Half a peck of potatoes, and one or two pounds of bullock's liver almost raw, formed an ordinary meal.

Again, he had false perceptions. He used to sit brushing away the flies with his hand for hours together, when there were no flies, and his landlady told him so.

For a fortnight before the fatal act he appears to have wandered about the country.

On the day of the murder he entered the village of Cramond with a black handkerchief covering the lower part of his face, (which was proved to have been long his practice, and therefore nothing was founded upon it as a means of concealment,) a stick in his hand, and a book hanging from his wrist. He asked alms from several persons in a row of houses, without success, and then entered the cottage of Widow Geddes, and in a short time fled from the house, having first cleft, with the sharp edge of a spade, the head of its defenceless inmate almost in two. Although there was money open in a cup, he took nothing from the house.

When apprehended next morning, some miles from Cramond, he was quite composed, denied all knowledge of the murder, and even of having been at Cramond the day before. In this denial he persisted to the last, making one uniform answer both before and after his trial, "Nobody saw me do it."

He was found guilty, condemned, and executed.

Mr Watson, who examined Howison before the trial and gave evidence at the same, states,\* "that insanity was not shown to have existed by any part of his conduct either before or after the fatal deed; but that Drs Mackintosh, Scott, and Alison gave it as their opinion that he was in a state of insanity when he committed the murder." And there appears to be in this case undoubted evidence of disease of the moral principle, exhibiting a want of the consciousness of right and wrong, existing some years previous to and at the time when the crime was committed.

Howison's morose temper, strange life, superstitious practices; his disgusting meals; the murder of a helpless old woman, whom he had never before seen, and whose only provocation could have been the refusal of alms, which very alms he neglected, though in his power, to take, were not the acts of a being conscious of right and wrong, and responsible as a moral agent to God and man.

The remark of Ray,† "that in cases of moral insanity it is not

\* A Medico-legal Treatise on Homicide, &c. p. 339. Edinburgh, 1837.

† Op. cit. p. 175.

the abstract notion of the nature of crime that is altered, but the real character of acts misconceived and not associated with their ordinary moral relations," is applicable to the case of Howison, and bears out the stern judgment of him who, from his knowledge of the varieties of mental disease, was most competent to deliver a verdict in such a case, "that Howison fell a victim to ignorance.\*"

His case has many features in common with that of Stalker.

In both perversion of the moral feelings was proved to have supervened some years previous to the perpetration of murder, and to have existed up to that time. Both had slight provocation, both attempted to save themselves by flight, and both, according to the law as laid down by the fifteen judges, ought to have been acquitted, having been by disease deprived of the consciousness of right and wrong.

There seems to be no other test whereby it could be shown that Howison ought to have been acquitted on the ground of his now universally acknowledged insanity. But he did not happen to be arraigned before the enlightened judge who tried Stalker, and who, by his lucid exposition of the nature of the disorder and of the law bearing on it, saved the county of the awful exhibition which occurred in the case of Howison, of a Christian law avenging itself on one stricken and rendered irresponsible by the hand of God.

Conclusive evidence, therefore, of general perversion of the moral feelings, (as in the case of Howison,) or of disorder of one or more of the affections or desires, (as in the case of Stalker,) in those in whom the moral powers were previously sound,† as clearly proves the loss of consciousness of right and wrong, annulling thereby criminal responsibility, as total loss of the intellectual faculties, or disorder of one or more of them, proves that the dictates of reason have ceased to exert their influence. The latter deduction is never contested; why should the former, which is drawn from similar premises? Why should so learned a labourer in the cause of science as Dr Guy‡ apply the term presumption to the latter, while admitting the former?

The main proof, then, required to substantiate the plea of partial insanity in cases of murder, &c. is the existence of disease of the moral principle; of the power of appreciating right and wrong, as evinced in disordered action of one or more of the affections or desires, in those in whom their action was formerly healthy; while

\* Prichard, *Op. cit.*

† How far the primary manifestations of this disorder are under the control of the will is a question unconnected with the point at issue. See this subject discussed in an essay by the Rev. J. Barlow, "On Man's Power over Himself to prevent or control insanity." London, 1843.

‡ *Op. cit.* p. 261.

*2dly*, The presence of any direct exciting cause (as disappointment in Stalker's case) will strengthen the plea.

*3dly*, The absence of such inducement as has been found sufficient to stimulate sane minds to the commission of crime, must always be considered as an important element in the accused's proofs of irresponsibility. The quarrel which Stalker had with his wife would not have operated on a sane mind to the commission of murder, nor had Howison sufficient apparent reason to impel him to the murder of the widow Geddes.

*4thly*, Indifference and apathy, beyond the power of simulation, as to the extent of guilt incurred, will go far to prove inability to appreciate moral responsibility. Stalker smiled in the face of the judge about to try him for murder.

*5thly*, If the progress of monomania be such as I have endeavoured to sketch it, the existence of hallucinations, (as in Stalker's case,) or of false perceptions, (as in Howison's,) must greatly strengthen the evidence for the defence; although, in opposition to Lord Erskine's opinion, "that an act, the immediate result of a delusion, was not amenable to punishment," the rule of law is, "that nothing can justify a wrong act except it be clearly proved that the party did not know right from wrong;" that, if he did, "he was equally liable with a person of sane mind."

Mercy would fain advocate the dictum of Lord Erskine as applicable to cases of insane impulse to murder, (instinctive insanity,) accompanied by a hallucination, such as that the act was the command of the Almighty.

The third variety of partial insanity is that termed **INSTINCTIVE INSANITY.**"

This disease is characterized by a sudden insane impulse to the commission of crime seizing one whose intellectual and moral powers are alike healthy. There exists a knowledge of the impulse, a full appreciation of the extent of guilt incurred, a striving against the impulse, which is sometimes successful, sometimes not. Instinctive insanity may therefore be regarded as essentially a disorder of the will.

In the healthy mind volition or will is the result, *1stly*, of the manifestation of any desire or affection influenced; *2dly*, by the dictates of reason, which in their turn depend on a variety of causes, as the knowledge, power of conscience, habits, &c. of the person. Thus, a man desires to excel by the boldness of his riding, reason weighs the danger incurred against the reputation coveted, and the result, (the will to attempt it or not,) will depend much on the frame of mind of him who wills; but volition will not in any instance be exercised against the dictates of reason and of conscience.

In instinctive insanity, on the other hand, volition is diseased

and acts in opposition to the dictates both of judgment and of the moral principle. "The individual thus affected, without provocation or any other rational motive, apparently in the full possession of his reason, and oftentimes in spite of his most strenuous efforts to resist, imbued his hands in the blood of others; oftener than otherwise of the partner of his bosom, of the children of his affections, of those, in short, who are most dear and cherished around him."\* "Il ne presente aucune altération appréciable de l'intelligence ou des affections. Il est entraîné par un instinct aveugle par quelque chose d'indéfinissable qui le pousse à tuer."†

The following case illustrates the character of instinctive insanity, and is peculiarly suited to the present remarks, having likewise been made the subject of a plea of insanity in a case of murder.

*Case of instinctive Insanity, leading to the commission of Murder; verdict, "not guilty, on the ground of insanity."*‡

Martha Brixey, aged 18, a nursery-maid, was represented to have been naturally of a quiet and inoffensive disposition. She lived at Greenwich, in the service of Mr Finch, solicitor, and was uniformly kind and attentive to the children. She was very much liked in the family, and was treated with great kindness. For some months previous to the commission of the act for which she was tried, she had laboured under suppression of the catamenia, for which she had latterly received medicines from the family surgeon. Two or three weeks before the event, she was observed to become dull and restless, and complained of a curious sort of aching pain in the head. A death had taken place in the family, and she displayed great fastidiousness and irritability about her dress. In consequence of this unsettledness she was on the 2d May 1845 warned by Mrs Finch to leave. On the day following, Mrs Finch mentioned that she had been to Deptford to see a young woman who was coming to take her place in the nursery. Martha said she was very sorry, indeed, for what happened, but hoped she would be forgiven and allowed to stop. On the afternoon of that day she appeared quite comfortable, and was heard singing in the nursery. In the evening she said to her fellow-servant, "I need not make myself so very unhappy as I do; one would think I had committed murder, but I have not done so." She then asked if a woman was ever hanged; and on being told that if they commit murder they were hanged, as well as men, she replied, that she would as soon be hanged, as transported or put into a mad-house. On the morning of Sunday the 4th, the day im-

\* Ray, op. cit. p. 133.

† Esquirol, *Des Maladies Mentales*, &c. Tom. ii. p. 793. Paris, 1838.

‡ Report of Trial at Central Criminal Court, on Friday, 16th May. Times, 17th May 1845. And Medical Gazette, No. 912, Vol. xxxvi. p. 166, 23d May 1845.

mediately succeeding, she said to her fellow-servant in the nursery, she would not leave, for she did not like another to come in her place. At a quarter past nine o'clock, while washing the breakfast things, she said to the house-maid, "Oh Elizabeth, I wish I was dead." On that morning she had nursed the infant, who was put to sleep in his cot about half-past nine o'clock. At this time she asked the head-nurse whether she thought Mrs Finch would allow her to remain; and on being told she would not, she stood still for a minute, biting her nail, "as if in a study." About twenty minutes before ten o'clock she was seen going into the pantry. The house-maid followed her, and saw her take a table-knife out of the box. On asking her what she was going to do with it, she replied, that she was going to cut a pencil for Miss Mary. On being told that a smaller knife would do better, she said she would take both, as the larger one would do to cut the children's bread and butter in the afternoon. She then tried the edge of the large knife with her finger and thumb, and went up stairs, carrying them both with her. Almost immediately afterwards a scream was heard. The unfortunate girl entered the dining-room, where Mr and Mrs Finch and a friend were sitting, and addressing her master in a very excited state said, "Oh, Sir, what have I done? Will you forgive me?" They all rose up, and her master cried "What," "Oh Sir," she answered, "I am a murderer; I have murdered the dear baby, I have cut the dear baby's throat." On going up stairs, the father found his child lying in its cot quite dead, with its head almost severed from its body;—the cut went back to the vertebrae. Meanwhile, the girl continued addressing those around her, saying, "Good God! I have cut the dear baby's throat. What will become of me? What will be done to me? Do you think God will forgive me if I ask pardon and repent?" She then fell down on her knees and prayed God to forgive her.

She was tried, and the jury found a verdict of not guilty, on the ground of insanity.

As Dr Skae has justly observed,\* "all the conditions which are considered essential in legal definitions of insanity were in this case wanting. There was no delusion; there was no evidence that the accused party was ignorant that she was offending against the laws of God and man, in the act she committed, but, on the contrary, she seemed perfectly conscious of offending against both; the absence of motive could not be pleaded, for she had a motive—it is certain that the girl escaped hanging in spite of the law."

Indeed, the law of England does not recognise the existence of instinctive insanity. "Nothing can justify a wrong act, except it be clearly proved that the party did not know right from wrong,"† and it cannot be doubted that the admission of the plea of an in-

\* Loc. cit.

† Answers of the fifteen judges already quoted.



sane impulse, in a mind apparently (both intellectually and morally) sane, as a justification of crime, would deprive punishment of much of the fear and control which it now exerts over the vicious.

The undoubted existence, however, of instinctive insanity, as recognised by every writer on insanity,\* and the consequent possibility of man's vengeance, in such a case, following heaven's visitation, must ever render it a matter of deep and serious consideration for our juries and judges, whether parties accused of capital crimes be amenable to a human tribunal or be responsible only to a higher power.†

The following table exhibits the diagnosis of the three forms of partial insanity, (monomania, moral insanity, instinctive insanity,) treated of in these remarks.

| MONOMANIA.                                                                                                                                                                              | MORAL INSANITY.                                                                                                                                         | INSTINCTIVE INSANITY.                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Intellectual faculties disordered, a delusion present.                                                                                                                                  | Intellectual faculties sound.                                                                                                                           | Intellectual faculties sound.                                                                                                                           |
| Generally diseased action of the moral principle, evinced by alteration of character, affections, or desires prior to the manifestation of the delusion and to the commission of crime. | Consists in diseased action of the moral principle, evinced by alteration of character, affections, or desires manifested prior to commission of crime. | Moral principle healthy, perfect consciousness of right and wrong, and of the extent of guilt, legally and morally incurred by the commission of crime. |
| Volition healthy, i. e. guided by the existing state of the reason and of the moral principle.                                                                                          | Volition healthy, i. e. guided by the existing state of the reason and of the moral principle.                                                          | Volition diseased; crime committed in opposition to the dictates of the reason and of the moral principle.                                              |

**ART. VIII.—On the Ganglionic System of Nerves.** By C. RADCLYFFE HALL, M. R. C. S., Eng. &c. Part Fourth. With Illustrations. In continuation of a paper on the Ophthalmic Ganglion, Part Third. Edinburgh Medical and Surgical Journal for October 1846, Vol. lxvi. p. 353.

*Relation of the Ganglia to the other Nervous Centres.*

THE term ganglion was applied by Galen to enlargements on the nerves, from their resemblance in outward appearance to small

\* Esquirol, Prichard, Marc, Georget, Ray, Griesinger, &c., &c.

† It appears to me to be an experiment worthy of trial, whether the substitution, in capital cases, of confinement for life (and the time for repentance thereby afforded) would tend to the increase of crime?

Mr Ewart, in March last, stated in the House of Commons, that in Belgium, where capital punishment had been abolished and again revived, the crime of murder had, since the revival of capital punishment, increased twenty-five per cent. Mr Sampson has devoted a chapter of his treatise "on Criminal Jurisprudence considered in relation to Cerebral Organization" to the statistical illustration of the tendency of capital punishment to act as a stimulant to the perpetration of murder.

enlarged bursæ, which Hippocrates had designated ganglions. (Béclard.) Gall was the first to extend the application of the word to the various grey masses in the encephalon. Reil, Walther, de Blainville, Carus, and many others, sanctioned the innovation. Even the partial enlargements of the chord, where the nerves of the extremities are given off, and the entire mass of convolutions of the cerebral hemispheres, are termed ganglia. Such parts, however, are never considered to belong to the ganglionic system; each of them has, or may have, its own anatomical designation, and certainly possesses no claim to the title of ganglion, if used in its literal signification of nerve-knot. For the purpose, then, of excluding the various nerve centres of the encephalon and chord, a ganglion may be defined to be a nervous centre, possessing nerves of communication and nerves of distribution. All nervous centres, it is true, are connected together by some nerve-tubes; but if we consider the packing up of such filaments in a distinct sheath, essential to the constitution of a nerve, the ganglia alone communicate by means of nerves.

A ganglion consists essentially of nerve-cells connected with the terminations of grey nerve-tubes. Every other nervous centre requires the addition of the white nerve-tubes, to some of which, in all cases, it furnishes the centric attachment. A ganglion, with very few exceptions, likewise possesses white tubes, but it never gives origin to them. These white tubes pass through the ganglion without any interruption of their continuity; they neither join with each other nor with the grey ganglionic fibres, nor do they open into the ganglionic cells. The ganglia, as a class, present marked differences in the presence or absence of these white tubes, and in their kind and proportion when present. On these differences may be founded an attempt to arrange the various ganglia.

The grey enlargements on some gangliated nerves formerly referred to,\* which, from not appearing to be traversed by any white nerve-tubes, may be considered as mere nuclei of augmentation for ganglionic filaments, are few and inconstant. The indubitable existence of one such simple ganglion, however, will suffice to prove that, 1. the action of the white nerve-tube is not essential to that of the ganglionic cell; and, 2. that whether or not the grey ganglionic nerves of distribution can act centripetally, (ganglionad) they must be able to act centrifugally. It follows that the gangliated white tube is extrinsic, and possesses so intimate a relation to the ganglion only for the purpose of influencing its activity, not for that of conferring upon it the power of acting. There is nothing in the arrangement of the white tubes in differ-

\* Page 329, Edinburgh Medical and Surgical Journal for October 1846.

ent ganglia to favour the idea, that different nerve-tubes react variously on the ganglionic cells through which they pass ; nor is there any adequate variation in the grey constituents of different ganglia to account for their peculiarities of function. For this we must refer to the difference of origin in the nerves transmitted.

Through one or other kind of ganglion, every variety of white nerve-tube is transmitted, excepting only that of voluntary motion. Indeed it is solely by inference that the volitional nerve is excepted, since voluntary muscles in some instances do certainly receive white nerves which have previously passed through a ganglion. The diaphragm, for example ; *rectus capitis anticus major* ; *longus colli* ; *buccinator* ; and perhaps some other muscles concerned in mastication ; occasionally, the *obliquus inferior oculi*, if that be a voluntary muscle ; and some of the laryngeal muscles. But as the sentient surface which the given ganglion supplies is physiologically related to the automatic and combined contraction of these muscles rather than to their voluntary action, there is no difficulty in conjecturing that the gangliated white nerve-tubes of voluntary muscles are spinal in their origin ; or if in part cerebral, that they are sensational only, not volitional. All the muscles in question invariably receive other motor nerves which have no connection with ganglia, and these exclusively may be deemed to convey volitional influence. Although not proved, this is so probable that we might correctly predicate of a muscle which received none but gangliated nerves, that it could be neither completely nor partially a voluntary muscle. Strictly speaking there is no entirely voluntary muscle in the system ; since every muscle receives spinal motor nerves which may cause its contraction independently of the will.

The posterior root of every spinal nerve contains spinal excitor nerve-tubes which end in the chord, and sensational excitor nerve-tubes which end in the brain. The two kinds are not anatomically distinguishable ; they pass together through every compound ganglion ; probably react alike on the ganglionic cells during their passage ; and though disproportionate in their distribution, they terminate peripherically together. It would be convenient to employ some common designation to signify this constant anatomical and functional combination. The term "afferent" has been adopted as regards the nerves of the spinal chord ; but in reference to the nerves of the ganglia, it is exceptionable for the same reason as the word "excitor," viz. that we have no ground to doubt that the motor nerves which enter a ganglion "excite" its action, and bear to it a stimulus, precisely as the nerves connected with the spinal excitor roots do themselves. To the terms spinal, sensational, or cerebro-spinal, the objection is, that they imply either too much or too little. Distributed chiefly to the surfaces

of skin, mucous membrane, or vessels, the designation surface-nerves might be an allowable Germanism, did it not exclude the filaments which we must assume to confer impressibility on parts, which have no free surface. The only physiological guide seems to consist in this impressibility, which is common to all the nerve-tubes of the posterior cerebro-spinal roots. They agree in that they all communicate an impression made at their periphery; affecting the chord when only spinal action follows; implicating the brain if sensation ensues. In all investigations concerning ganglionic action, the distinction between these cerebral and spinal components is purely inferential, and cannot be founded on anatomical demonstration. Wherever a contribution to a ganglion proceeds from a posterior spinal root, it contains both kinds of nerve-tube, and may be described as an *impressional* nerve.

A ganglion having to superintend molecular organic processes, its first element is that of the organic cell and nerve. Having to associate this organic activity in some instances with impressions made under various modifications on other tissues, the second element is, that it gives passage to an impressional nerve. Associated with the comparatively regular action of involuntary muscles, the third element is that of transmitting an involuntary motor nerve. All but the purely grey simple ganglion, therefore, may be considered as compound;—double, when two elements exist, as in the spinal ganglion; triple, when to the grey and to the impressional nerve, a motor one is added, as in the sympathetic ganglia.

A spinal ganglion, in furnishing organic excitement to parts, is controlled only by the action of the impressional nerves distributed to them, and by the general condition of the ganglionic system. Hence it need transmit its own particular nerves of impression only. But the organs supplied by a sympathetic ganglion must respond to stimulation, sometimes of one, sometimes of another discontinuous part. Hence, a sympathetic ganglion requires a supply from the general centre of origin common to the nerves of all these associated parts. Such a supply is obviously obtained most conveniently by a small contribution from the nerves distributed to each of these parts being sent to the ganglion. In accordance with these functional requirements, we find that spinal ganglia never receive contributions from any other nerve than that to which they especially belong; excepting always the grey filaments of communication which are common to all ganglia alike. They never give off any branches distinct from their grey filaments packed up in the nerve of distribution.\* Whereas, a

\* The filaments described by some anatomists as proceeding from the Casserian ganglion itself, and others from the roots of the fifth nerve contrad to this ganglion, to the membranes of the brain, I have never been able to find.

sympathetic ganglion receives contributions from any neighbouring nerve having a functional connection with parts over whose organic activity the ganglion presides ; and gives off branches for distribution in any direction.

A spinal ganglion is always placed on the roots of nerves. A sympathetic ganglion ~~on the~~ branches. A few ganglia, triple in their composition, and so far resembling the visceral ganglia in general, have certain peculiarities which entitle them to an intermediate place between the purely spinal ganglia and the visceral. They are placed neither on nerve-radicles like the former, nor on nerve-branches like the latter ; but always on a nerve-trunk, part only of the filaments of which they involve. Intermediate also in their physiological relations, being allied to the spinal in their more especial functional connection with the individual nerve-trunk on which they are placed ; yet resembling the sympathetic in possessing motor elements. The inferior ganglion of the vagus is a type of this class. As this has been termed "plexiform," we may distinguish the class by the same name, with the condition that, in proportion to the varying amount of their entrant nerves, all ganglia are plexiform. The inaccuracy is of less importance than the possible obscurity which might arise from adopting a more correct new name. Nor in this respect is there any inferiority to the received nomenclature of the other ganglia, since all compound ganglia are literally both spinal, as transmitting spinal nerves, and sympathetic, as maintaining organic sympathies with related parts. As a synonym for a plexiform or nerve-trunk ganglion, the term "fusiform" might be adopted, implying the ordinary form, without signifying anything as to structure or function. Thus, if a ganglion be placed on the roots of a nerve, give off no branches, and receive no contributions from any other nerve, either motor or impressional, than the one to which it belongs, it is a spinal ganglion. If a ganglion be found connected with any other portion of a nerve than its radicles, it will also be found to receive contributions from at least one motor nerve, and generally to give off direct branches of distribution, and is a sympathetic ganglion. If a mere nodule, entirely grey, and connected with other ganglia only by means of grey filaments, it is a simple ganglion—neither spinal nor sympathetic. Of the sympathetic ganglia, if one be an eminence containing grey cells in the course of a nerve-trunk, through which a portion of the nerve-tubes pass, it will be found to receive contributions from other nerves of different function, and is a fusiform sympathetic ganglion, or a nerve-trunk ganglion. The remaining ganglia may be called isolated sympathetic ganglia, or nerve-branch ganglia.

Assuming the correctness of these distinctions, there can be no longer any difficulty in classing the ganglia. When two occur

connected with the same nerve, as in the glosso-pharyngeal and vagus, one only can be spinal, since one only can be attached to the nerve-roots. The second can always be demonstrated to receive a motor contribution, and by this alone is proved to be a sympathetic ganglion. The threefold division of the ganglia is equally plain if founded on physiology. The simple, or as consisting of one element merely, the single ganglion has no direct relation with either impressions or movements; the spinal, or double ganglion, is connected with impressions, but not directly with muscular motion; the sympathetic, or triple ganglion, is connected both with impressions and with muscular action. A sympathetic ganglion usually receives filaments from various motor nerves. This is true of all the prævertebral ganglia. It is true also of several of the encephalic, (*e. g.* the lower ganglion of the vagus; the otic; the submaxillary.) One motor nerve may send filaments to more than one ganglion, (*e. g.* the facial nerve); but there is no proof that the same motor filament ever passes through two ganglia.

It is otherwise with respect to the impressional nerves. Every gangliated impressional nerve has already passed through its own spinal ganglion before its entrance into a sympathetic ganglion. But, moreover, the same impressional nerve may pass through a series of sympathetic ganglia; the glosso-pharyngeal and the vagus, for example, each send a contribution to the two fusiform ganglia on the *portio dura*; to the otic; submaxillary; and perhaps to Meckel's ganglia. Tracing the filament from the glosso-pharyngeal nerve to the submaxillary ganglion, it passes through, 1st, the spinal ganglion of the glosso-pharyngeal (*Ganglion jugulare*); 2d, the fusiform ganglion of the same (*G. Petrosus*); 3d, along with the *ramus auricularis* of the vagus, through the inferior fusiform ganglion of the *portio dura*; 4th, as a component part of the *chorda tympani*, through the submaxillary ganglion; through the medium of which it may extend its influence, if not its course, to the sublingual gland, thus constituting a direct medium of connection in functional activity between the several salivary glands, and gustation, so far as that depends on the glosso-pharyngeal. This will be more fully considered hereafter; but at present it serves to illustrate the physiological reason, or final cause, of the presumed difference of arrangement between the impressional and the motor nerves in relation to the ganglia. A muscle has a given duty to perform in obedience to the will, or to excitement of a particular surface. During its action, increased secretion may be desirable on its own related surface, but not on several distinct surfaces or on several distinct organs, at the same moment; unless when the associated action of a group of muscles is necessary, in which case, the nerves of impression must be implicated, and will discharge sufficiently any required association.

Hence, a muscular nerve can directly influence only the one ganglion which presides over the organic activity of the surface which the muscle obeys. Were it not so, the contraction of a single muscle might excite secretion in several unallied parts, which would be an extravagance. An impression, on the contrary, requiring excitement of organic action in one part, usually needs it simultaneously in several (*c. g.* any part of the process of digestion); this is at once effected with small expenditure of structure, by causing the same impressional nerve to set to work simultaneously all the allied ganglionic centres.

With similar economy is a sympathetic ganglion subjected to the influence of several, or, occasionally, (as in the superior cervical ganglion,) of very many nerves, any of which can probably excite the action of the ganglionic cells, without, as already inferred with respect to the ophthalmic ganglion, affecting the state of the other nerve-tubes transmitted by the ganglion. This, which is an important law, is proved by the structure of a complicated ganglion, such as the superior cervical, as distinctly as it could be by the most accurate experimental investigation, were the question open to complete solution by such means. Unless the white tubes, which pass through the ganglion, do influence it, of what use would be their transmission? Unless all, whatever their functional endowment, influenced it alike, would there not be some difference discernible in their relative arrangement? and unless each nerve could act on the ganglion without exciting its fellow white nerves, would not strange confusion of action result? When gastric excitement, for example, through the medium of the *par vagum* acted on the superior cervical ganglion, stimulated the *nervi molles*, and distended the capillary system of the face, producing heat and flushing, if the excitement spread to the other nerve-tubes transmitted, we should have always, and of necessity, conjoined the muscular actions presided over by divisions of the facial, hypoglossal, spinal accessory, and upper cervical nerves, in addition to a conjoint excitement of the transmitted impressional nerves. The influence of the transmitted tubes on the ganglionic cells is deducible again from the double gangliation of several important nerves. Unless it can react on the grey cells, why is a motor tube so carefully excluded from a spinal ganglion which supplies parts, whose organic activity would be injured by direct and therefore constant connection with muscular movement, whilst it is always admitted into a sympathetic ganglion which governs organic processes constantly under the influence of muscular contraction? The lower ganglion on the vagus, on the glosso-pharyngeal, the various subsidiary ganglia on branches of the fifth exist, not because the ganglia on the roots of these respective nerves could not have furnished organic nerve force suffi-

cient, but because a portion of the nerves only must have its supplied parts associated with muscular action, whilst the remaining and larger portion of the nerves is distributed to parts not constantly under the influence of muscular movement. For the same reason are the ganglia on the spinal nerves so accurately restricted to the posterior roots. The anterior motor roots avoid the spinal ganglion, not because their voluntary power would be checked by the mere circumstance of their passing through it; but because the uncertain, unequal, irregular action of a voluntary nerve would greatly interfere with the functions presided over by the ganglion. For the same reason, it may be, are spinal ganglia necessary at all, to constitute centres distinct from the chord; and sympathetic ganglia to constitute centres distinct from both. Since in man, as we found in the *INVERTEBRATA*, nervous centres are amalgamated or disjoined, according as the functions governed are connected or dissociated. But for this, the sympathetic, vagus, and glosso-pharyngeal would not need three separate, but similarly constituted ganglia lying side by side, nor would the eye require an especial ganglion, whilst the lacrymal gland does not.

In the circumstance of some white tubes passing through several ganglia, we see a confirmation of conclusions otherwise obtained. On the hypothesis of every ganglion being a source of motor force, these white tubes could not excite movement in the ultimate ganglion (D), without at the same time exciting contraction of muscles supplied by each of the other ganglia, (A, B, and C,) through which they had previously passed. If ganglia conducted to sensation, a part supplied by a sensational nerve could not have its sensibility affected singly. Its own would be conjoined with sensation in every organ supplied by the other related ganglia, (A, B, and C.) And if, under normal excitement, the grey cells of a ganglion excited the white-tubes transmitted, any one of the related ganglia (A, B, C, and D,) would be unable to act without occasioning the same sensations, and muscular actions; and the transmitted tubes re-acting on the cells in return, ganglion A could never act at all without implicating the rest. Experience teaches us that moderate excitement of one organ does not necessarily occasion either movement or sensation in another; although it frequently does occasion increased secretion. If, therefore, an impressional filament passes through A, B, C, and D, and then proceeds to its distribution, we conclude that it is in order to connect together the organic activity of processes superintended by A, B, C, as well as D, with the state of sentient surface ultimately supplied by the nerve-filament in question.

*Hypothesis of the rationale of ganglionic action.*—A simple ganglion appears to be merely a centre of multiplication for ganglionic nerves, by means of which one grey filament from the



compound ganglion A, may carry excitement to ten or twenty grey filaments arising in the simple ganglion B. Herein no other than grey filaments are implicated as far as the simple ganglion is concerned. But in addition to this conduction of excitement along the grey nerve of intercommunication possessed by all ganglia, a double or spinal ganglion is stimulated by the white impressional nerve-tubes which pass through it. An impression on the skin stimulates the cutaneous nerve at its periphery. The excitement affects the entire length of the nerve, and where the white-tubes separate from each to inclose the grey cells of the ganglion, they impart the excitement to these cells. Thus excited, the grey nerves of the ganglion cause increased organic activity in the part to which they are distributed, which is always the same as that which the corresponding impressional nerve supplies. The result may show itself in mere attraction of blood to the capillaries, (rubefaction from friction), or in secretion, (sweating or vesication). From the same impression, the spinal chord being excited, involuntary muscular action may ensue; or, the influence extending to the brain, sensation and voluntary movement occur. In neither case will the muscular motion have any direct influence over the spinal ganglia. On them emotion appears to be the only additional agent which possesses this power of acting from within.

It is otherwise in a sympathetic ganglion. The mucous surface of an intestine cannot undergo irritation without the stimulus affecting the impressional nerve, the chord, and the spinal motor nerve. In the internal tegument, spinal excitors exceed the nerves of sensation; the reverse obtains in the skin. The motor re-action being uncontrolled by the will, is not a matter of chance but is constant. Hence, in a sympathetic ganglion the grey cells and nerves are submitted to a double excitement. Stimulated on the one hand by the impressional, on the other by the motor nerves, organic activity corresponds both to the impression made and to the movement which results. In this, as in every other arrangement of nervous mechanism, the final cause is twofold; perfect obedience to a normal stimulus; perfect protection from abnormal irritation. By the response of the sympathetic ganglion to the impressional nerve, defensive mucus is instantly poured out; by its further response to the motor nerve, the mucous channel becomes still more lubricated, whilst the cause of irritation is passed on. In this view the chord is made the key-stone of the arch in the action of every compound ganglion; and it generally is so, because increased ganglionic action in most instances responds to stimulation of some surface, and the grey are not surface-nerves. But they are probably the vascular nerves, as far as the capillaries are concerned; and through the medium of the blood, an impression may be made on them earlier and more powerfully than is commonly made on the impressional nerves through the

medium of external stimuli. There appears no reason why peripheral stimulation of the grey nerve may not occasion change of action in the ganglionic cells, and in virtue of this change have its own influence over capillary and molecular actions affected; distinct from and independently of any excitement of spinal or cerebral nerve-tube.

We may illustrate this by referring to the frequent variation in the activity of a secreting gland. In the kidney, for example, when the presence of more blood than usual, or the existence in it of some diuretic, occasions increased urinary secretion, it may be that the stimulation affects only, first the secreting cells, then the grey nerve, which in turn causes increased afflux of blood and still more rapid molecular change. Or the grey nerve may be the first link in the chain; and secreting cell and capillary the second. In either case it is unnecessary to assume any implication of white tube, or any reflex action. Still in almost every instance with which we are familiar, the chord is co-operative with the ganglion; and in many the brain participates. When lithic acid is irritating the kidney, it checks secretion by deranging the grey nerve; it may cause cramp by deranging the spinal nerve; and pain in the loins by deranging the cerebral. A small dose of turpentine will do the same.

A second series of phenomena from the same cause, in higher intensity, may be renal irritation, spasmodic retraction of the testis, nausea and vomiting, and febrile disturbance. In this and in every analogous case, brain, chord, and ganglion, all work together. In fever commencing with the blood (true typhus), the derangement may affect in order, blood, grey-nerves, and ganglia, chord and brain, inducing their various reactions, which include every possible kind of derangement of which the system is susceptible.

In the nervous supply to a gland we find white tubes. In the large renal plexus, although grey nerves predominate, there is a quantity of white nerve. The kidney possessing no inherent contractility requires no muscular nerves. For the blood-vessels and excretory ducts a few may be required. And as the kidney, like other glands during normal action, conveys no sensation, although some nerves of sensation are needed in it, as in every other living structure, to give us timely notice of disorder, yet for this,—the exception not the rule,—added to the small requirement for motor nerves, the proportion of white tubes appears greater than would have been necessary. The urinary secretion is greatly under the influence of the condition of the blood, as to quantity and quality; and of the circulation, as to force and rapidity; yet when over-secretion in the kidney is consequent on a given state of some distant part, no general interference with the action of the heart or the condition of the blood existing, the

command to the kidney can be conveyed only through the nerves. Imitation and fear influence the organic nerves of the kidney through ex-centric action of the nerves of sensation; cold to the skin, partly through sensation; chiefly through spinal action, affecting the secretion of the kidney through impressional nerves, the contraction of the urinary canals through motor nerves.

Ovarian irritation in hysteria occasions diuresis, partly by emotion, partly by spinal excitement, in a similar way. Now, if analogous sympathies occur without our consciousness of their operation, without sensation or emotion, we have no evidence of cerebral participation, and may reasonably infer that the effect is produced entirely through the medium of the chord and ganglia. The sympathy between the stomach and the kidney is a common illustration. Reversing the order, and commencing in the kidney, irritation there can only re-act on distant parts through the intervention of a common centre. The chord and the brain are centres common to every part, and each admits of instant response to excitement. The ganglionic system is likewise a common centre of supply for the organic nerves, but is unfitted by its structure, and by the absence of direct relation to exposed surfaces, for producing sudden sympathetic actions of distant parts. A grey nerve has never been traced right through ganglion A, B, C to D, but if it joins A it ends there; another connects A with B, and so on. A grey nerve could not, therefore, convey excitement to D, without exciting in its course A, B, and C. It does this, and by so doing produces the general harmony in organic action met with in perfect health. But by doing this, it is unfitted for the production of sympathies. The ganglionic system is the engine, but the brain and chord are, one or both of them, the engineer. Either brain or spinal chord would, therefore, be more justly entitled the centre of the sympathetic system, than what we now term such; but by referring the various associated phenomena to different heads, according as ganglionic, spinal, or cerebral action predominates, we shall attempt to establish a natural arrangement of sympathies.

A secreting organ receives white nerve tubes, therefore, in order that it may be brought into such relation with chord and encephalon as will permit of sympathetic actions, normal or abnormal. For the purpose of governing the disposal of ganglionic energy, by the intimate connexion of the encephalic nerves, but more particularly of the spinal nerves, with all parts of the sympathetic, the brain and especially the chord seem peculiarly fitted. But still as the sensorium generally presides over the spinal motor tract, and yet the chord itself is an independent centre; so also the chord being the medium of quick communication between distant organs, presides over the consentaneous action of their ganglia, and yet the ganglia remain independent centres.

It is assumed throughout that the nervous force travels, in the sense in which similar language would be applied to the electrical force, *down the nerves*, whether the stimulus which calls it forth proceed from without, as in sensation, or from within, as in emotion. But this part of the hypothesis is not essential to the rest, and its refutation would nullify none of the other statements concerning ganglionic action. If it be preferred, therefore, to consider the impressional nerves as acting in all cases centripetally; the motor nerves centrifugally; the only difference in the explanation will consist in assuming that the excitor nerves stimulate the ganglia by acting in one direction; the motor and emotional nerves by acting in a reverse direction. According to this view the afferent nerves would excite the ganglionic nerves in a reflex; the efferent in a direct manner. It would be a necessary inference also, either that emotion acts only through motor nerves, which will not explain all the phenomena; or else that special nerves exist for conducting the emotional influence.

*Relation of the Ganglia to Emotion.*—Have we any reason for assuming that emotion influences secretion and nutrition through the medium of any special nerves; or does it not rather act through some or all of the nerves ascertained to possess other endowments? The state of excitement, or of marked depression, to which the term emotion is conventionally restricted, is merely a different degree of one, or more generally of several at once, of our common feelings of mental pleasure or pain. It is no one peculiar condition of mind; but a condition which may accompany any other. Feeling is essential to emotion; but we must not confound the state of mental consciousness which we so designate, and sensation. Sensation occurs with emotion, only when it excites our feeling; without it, when the sensation merely excites the intellect. Intellectual operations coincide with emotion when they arouse the feelings; but the highest efforts of pure intellect are compatible with freedom from emotion. Sensation can exercise itself apart from any act of volition, of intellect, or of feeling and emotion. Feeling can be exercised without volition, intellect, or sensation, but not without emotion, however low may be the degree. Volition can be exercised without reasoning, feeling and emotion, or sensation—although this rarely happens. Pure intellect can exercise itself without volition, sensation, or feeling and emotion. Emotion is never presented without feeling. Feeling is never presented without emotion. The centre for the one is probably the centre for the other. Accepting the ascertained power of functional independence as our guide for admitting separation of centre, we infer that the encephalon comprises a distinct centre for pure intellect; another for sensation; another for volition; and a fourth for feeling and emotion conjointly. Admitting association in the discharge of function to be a proof

of such a structural arrangement existing between the different centres as shall permit, though not necessitate, consentaneous action—we must expect all the centres to be anatomically connected. Consciousness resides equally in all. To mark out an especial organ for consciousness appears absurd. We are conscious of willing, of thinking, of feeling and emotion, and of sensation. Of these assumed separate centres, each can rouse one alone, several, or all of the others to co-operate with itself. Now emotion when intense always does this. As the emotional centre must therefore possess such an anatomical relation to the other centres as to impart its influence to each and all of them, it may thus affect each and every variety of nerve-tube originating in the several centres. So far we find no ground for admitting the existence of special nerves for conducting emotion. Emotion will heighten or obtund sensation; increase or diminish muscular power; promote, check, or chemically alter secretions. Hence, if there be any special nerves of emotion, not only must some of these accompany all other nerves, but they must have the precise relation in their distribution which each kind of the other nerves possess. Again, although different emotions are manifested in a very different manner, many of the same muscles are excited in each; in joy, grief, and rage, for example. Hence all the muscles of expression, *i. e.* almost every voluntary muscle in the body, would require a complete supply of emotional nerves, not only for emotion of one kind, but of every kind, originating therefore in every cerebral organ subject to emotion; and as every cerebral organ may become emotionally excited, the source of supply must be excessive. It is far preferable to assume that a *centrum commune* exists in the encephalon, through the medium of which every centre may influence the same nerve-tubes; where a sensation, a feeling, or an idea, may excite the non-psychical part of the nervous system, with or without the conjoint operation of the centre of volition on the same part.

Considering the centre of the feelings, and the centre of emotion, to be one and the same; bearing in mind the variety of mental conditions which enter into what we are accustomed to view as a single emotion, and the number even of the names under which we enumerate these various complex mental states, we shall hesitate in assigning to any comparatively small portion of the encephalic mass the office of centre of emotion.

By assuming the existence of a *centrum commune*, or common point at which the mental acts produce their first obvious effects on the body, we explain away the main argument for placing a distinct centre of emotion lower down than the *corpora striata*; viz. in some cases of extravasation into the lateral ventricle, muscular movements may be excited by emotion, notwithstanding all

power of effecting these by an effort of volition is destroyed. In explaining this, we are reduced to two alternatives. (1.) The seat of emotion must be placed below that of volition. (2.) There must be some other channel besides that of the volitional centre, through which emotion may affect the origin of the motor nerve-tubes.

Recollecting that all the volitional fibres are crossed; that the sensational ones are part crossed, part straight; that certain fibres of the motor tract also are straight, and that these cannot be volitional; we have only to assume that emotion can affect every kind of nerve-tube, as its centre can influence every other encephalic centre, and we shall have a full explanation not only of the fact above noted, but by analogy of several others heretofore inexplicable. Emotion may still affect the direct fibres, both sensational and motor, on the palsied side, although by an extravasated clot the crossed fibres are disabled. Sensation is scarcely ever quite obliterated in hemiplegia, because each half of the body has sensational fibres from each side of the brain. If the crossed fibres are compressed, the straight ones are not. In palsy, a patient is occasionally enabled to hold an object when looking at it, but not otherwise. Here the special sensation of sight reacts through the assumed *centrum commune*, precisely as a spinal excitor reacts on its corresponding motor nerve. We may thus account for the ordinary reaction of sensational upon motor nerves constantly taking place, though without our notice, and also for the simpler instances of what has been termed the reflex function of the brain. In many of the less simple examples adduced, to the merely physical, always similar reaction of mere sensation has been superadded the psychical, ever changeable, influence of the mind, roused to action by the sensation. The instantaneousness of result is not greater than in many acts allowed to be volitional. Perhaps the rare instances of complete cerebral palsy, without any disease of the chord, in which excitomotor phenomena cannot be artificially elicited, may be due to the controlling influence of the sensational centre upon the motor tract in preventing spinal action.\*

What relation has the cerebellum to this *centrum commune*? (See Figs. 29, 30, and 31.)

Assuming that the influence of emotion extends to all the ne-

\* On the questions alluded to above, see a review of Noble on the Brain, in the British and Foreign Medical Review for 1846; Todd and Bowman's Physiological Anatomy, Vol. i. pp. 346 to 360; Dr Laycock's writings; a correspondence in the Lancet for 1845, between Mr G. Combe and Drs Reid and Laycock; Dr Marshall Hall in his "Diseases of the Nervous System," § 984; and in the Lancet for May 15th 1847. More especially the various works of Dr Carpenter by the complete development of whose views we may confidently expect the subject will be cleared up.

cephalic nerves, we have to ascertain its mode of action. It can madden with excitement or kill by shock. All emotion, therefore, acts either as a stimulant or as a sedative, and it acts from within. If we can imitate its effects on distant and separate organs, by applying stimulants and sedatives from without, we gain as fair an argument as the circumstances permit, that both kinds of agency can affect similar nerves.

In the experiments of Le Gallois and of Wilson Philip, on artificially irritating various portions of the brain, and of the spinal chord after removing the brain, the action of the heart became accelerated. After tying the abdominal aorta in a frog, and thus cutting off the influence of the heart, on irritating the chord, the capillary circulation in the web of the foot underwent changes. Hence the same kind of stimulus may affect the same distant part through the medium of encephalic and of spinal nerves. The capillaries may be affected by irritating either the cerebral or the spinal nerves, but no experiments are recorded by which it is clearly established that they can be excited through the medium of the grey organic nerves alone, all assistance from the brain and chord being suspended. We may infer this, however, since it is proved that shock may so operate; and if the organic nerve responds to a sedative, it would doubtless do the same to a stimulant if we understood how to test it.

Instant death from a blow on the head or on the back is enough to prove that shock can act through either cerebral or spinal nerves. But if cases of accidental injury be unsatisfactory, the experiments of Dr Wilson Philip and of Brachet on warm-blooded animals, of Mr Clift on fishes, and of Dr Marshall Hall on batrachians, confirm the conclusion that shock from without,—and emotion is oftentimes but shock from within,—can act through cerebral, spinal, or ganglionic nerves. Through cerebral nerves combined with the other two; through spinal, disconnected from the cerebral, but combined with ganglionic; through the ganglionic nerves uncombined. From their structural relation to each other, the three kinds of nerve can only be isolated from above downwards. We cannot separate the chord from the ganglia in testing the action of spinal nerves, though we can cut off the ganglia from the chord in testing the grey nerves. We cannot separate the encephalon from either chord or ganglia in testing the cerebral nerves, though we can remove the influence of the brain in examining the spinal centre.

In Dr Wilson Philip's 17th experiment, the cervical part of the chord and lower half of the brain were first removed. Spirits of wine, tincture of opium, and tobacco, affected the action of the heart quite as much when now applied "only to that part of the brain which lies between the eyes of the frog, and precisely in the same way as when they were applied to the entire brain or

spinal marrow." The chord and the origin of all the nerves connected directly or through the medium of the sympathetic with the heart were destroyed. Through what medium was the influence transmitted to the heart? If there be no fallacy in the matter, there would appear some ground for admitting that grey sympathetic fibres might join the lower part of the brain anterior to the point of section, and that the stimulus might act through them; an important fact, if it were so. It is more likely that the strong liquids were imbibed and reaching the heart as rapidly as (from Mr Blake's inquiries,) we know it can, there stimulated the lining membrane of the cardiac cavities, which the investigations of Dr Charles Henry and of Mr Ransome have proved to be very susceptible to such an influence.

The most interesting and the neatest experiment is one of Dr Marshall Hall's, (*loc. cit.* § 24.) "Both the cerebrum and the spinal marrow," he writes, "may be entirely removed in a frog, by small portions at distinct intervals, without destroying the circulation in the web: this function, then, depends on (?), and can be impressed by the ganglionic system *only*. There is neither cerebral nor spinal function left; there is neither cerebral nor power of reflex excited motion. If we now crush one foot, an extraordinary effect is produced: the circulation in the other is instantly and completely arrested! This effect can only have been produced through the ganglionic portion of the nervous system; and I think this is the only published experiment of the kind."

If we deduce the mode of action of emotion from its analogy to that of other agencies which are open to experimental investigation, we shall arrive at the following conclusions: (1.) The ex-centric conduction of emotional influence cannot be restricted to the motor nerves, as that would not explain all the phenomena. (2.) As we have no data to justify our admitting a distinct and special class of nerves for the conduction of emotion only; and as, emotion being able to affect every point supplied with nerves of any kind, such an apparatus would need to be co-extensive with all the rest of the nervous system; the arrangement would be extravagant and appears superfluous. (3.) Emotion being essentially a condition of mind can only in the first instance affect nerve-tubes originating in the brain; but in virtue of what, for the sake of avoiding repetition, I may term the law of synergetic action, these cerebral nerve-tubes will affect secondarily all the grey nerve-cells through which they pass, thus imparting the emotional influence to the chord, and then to the ganglia. (4.) In similar mode, the nerve-tubes arising in the grey cells of the chord, having had their origins excited by the transmitted cerebral nerve-tubes, impart *their* excitement also to the ganglia through which they pass.



(5.) In this way, directly or indirectly ; primarily or secondarily, as regards our conception of the sequence ; but considering the celerity of nervous action, instantly it may seem as regards the result ; emotion can affect each and every nerve-filament in the body. (6.) So much being granted, the *occasional* conduction of influence in a centrifugal direction of sensational, spinal-excitor, and ganglionic grey nerve must follow.

We thus comprehend how it is that pleasurable emotions will assist, unpleasant ones derange, every function in the economy. We have confirmed what daily experience teaches, that to temperance and exercise we must add *good spirits*, to preserve health in its perfection. We see the philosophy of happiness, and the science of religion.

*Various ganglia.*—Amongst the ganglia of man enumerated by different anatomists, two have been named which subsequent examinations have failed to verify. The ganglion described by Cloquet as existing on the naso-palatine nerves in the anterior palatine canal, is in reality nothing more than the conjunction of the two nerves where they become enclosed in the same sheath. A ganglion stated by Huber to be placed on the spinal accessory and the posterior root of the first cervical nerve, where the two cross each other at a right angle, is merely a connection of the nerve-sheaths by means of fine areolar tissue. The ganglion of Ribes, on the communicating branch of the anterior cerebral arteries, I have never been fortunate enough to see. Its minute relations are not ascertained, but it is considered as the cephalic analogue of the *ganglion impar*. The spinal ganglia as a rule are never absent. Sometimes the first cervical nerve possesses no posterior root, and in that case it possesses no ganglion. In some amphibia the two highest cervical nerves always consist of the anterior non-gangliated portions only. The fusiform ganglia on important nerves and the more isolated sympathetic ganglia of the head are constantly present. Their function being the accurate association of certain intimately related sensori-motor parts, their deficiency would entail disorder of action. But the less especial sympathetic ganglia being rather for the augmented supply of organic nerves to parts widely related, than for special and exact association, vary considerably. All the small ganglia interspersed amongst the plexuses of the sympathetic in the carotid canal, in the neck between the carotid arteries, and in the thorax and abdomen ; the nodules on the vertebral branch of the inferior cervical ganglion ; the middle cervical ganglion, and the two or three higher prævertebral ganglia in the chest, are subject to variation. When deficient, their place is sometimes manifestly, perhaps always in fact, filled up by extra-development of a neighbouring ganglion. Thus, when the middle cervical ganglion does not exist, the spinal contributions

belonging to it are sent to one or other of the two sympathetic ganglia of the neck.

*Relation of the grey nerves to the encephalic and spinal centres.—*

It is difficult to determine whether the grey cells of a ganglion be directly connected with those of the brain and chord by means of grey filaments. It is quite certain that no purely grey nerve passes by itself from any ganglion to either of these centres; but as grey filaments are met with abundantly in many nerves of communication, we have to pursue these to their destination to decide the question. A "*ramus communicans*" between a sympathetic ganglion to a given cerebro-spinal nerve, where only one exists, will serve as the most intelligible type of the nature of the connection under consideration. If two exist, as frequently happens, one alone may possess the grey filaments. A perfect communicating nerve consists of both white and grey fibres. All the white tubes may be traced proceeding towards the chord, passing in distinct fasciculi into the anterior and posterior divisions of the spinal nerve-trunk. The grey filaments are not diffused amongst the white tubes, but keep together, appearing when compressed as a flat band. When they have reached the nerve-trunk, all the white tubes direct themselves centrad and become lost amongst those of the two sets of spinal nerve-roots. The grey filaments comport themselves differently. Immediately on reaching the nerve-trunk, they separate into two distinct and diverging bundles. One fasciculus passes peripherad along with the nerve for distribution. The other proceeds centrad into the intervertebral ganglion, amongst the cells of which the grey filaments are lost. The division into these two fasciculi never takes place whilst the grey filaments are yet in the *ramus communicans*; it occurs as soon as this joins the spinal trunk, and therefore at a very variable distance from the chord. This is well exemplified by the communicating branches from the first thoracic ganglion in most mammals. A short thick branch joins the largest brachial nerve at some distance external to the intervertebral foramen, whilst the junction with the higher brachial nerves which is effected by that branch of the ganglion which is enclosed in the canal with the vertebral artery, is much nearer to the chord. Although the grey fasciculus of the *ramus communicans* splits into its centric and peripheric divisions as soon as it reaches the nerve, yet as the junction with an extra-cranial nerve never takes place until after anterior and posterior portions of the cerebro-spinal trunk have become intermixed, we cannot ascertain at this point the actual relation of the ganglionic to the sensational and motor fibres in nerves of distribution.

So far as I have been able to ascertain, the whole of the grey filaments which direct themselves towards the chord, pass into the

spinal ganglion, and there terminate. I have never satisfied myself that I could distinguish a single ganglionic filament in either the anterior, or the posterior roots of the spinal nerves. For examination, I have used principally the long roots of the *cauda equina* in some young small animal, as the rat, mole, kitten, rabbit, and puppy. Cylindrical nerve-tubes, which vary greatly in size, are seen to cross each other in wavy bands in each root; but the smallest in calibre is clearly distinguishable from the ganglionic filament. Nor have I ever found grey filaments at the origin of any motor cerebral nerve; nor in the cis-ganglionic roots of the trigeminus, the glosso-pharyngeal, and the vagus.

Viewing the sympathetic as the source, the obvious direction of its communicating branches to the cranial nerves indicates generally that the sympathetic seeks the nerves, and not the centre in which they originate. In man the projection of the jaws being less than in any other animal possessing a neck, the cephalic portion of the sympathetic is more nearly vertical, and has no greater direction forwards than might be due to the tortuousness of the canal in the base of the skull, through which it has to pass. Still, even in man, whilst the parts are undisturbed, no twig from the carotic plexus is seen to direct itself in such wise as to reach in the shortest manner the roots of any cerebral nerve. The filaments to the tympanic plexus certainly proceed backwards; but these are undoubtedly for the purpose of distribution. The filaments which join the sixth nerve, sweep forwards and upwards, never directly backwards, as if for the purpose of arriving at the cerebral origin of the nerve. It is true that at the point of junction these communicating nerves often form an obtuse angle behind, as if the final direction of the filaments was towards the brain; whilst another communication will present an obtuse angle forwards, as if its direction was towards the distributed portion of nerve. But this arrangement may be accounted for by considering the former communication to comprise chiefly the nerve-tubes from the brain to the sympathetic; the latter to convey principally the filaments from the sympathetic to the nerve.

It is only in reference to motor nerves that the question can be raised; since certain grey filaments invariably join every ganglion; and as the sympathetic never, I believe, effects its junction with a spinal ganglion by entering at its centric end, or in company with the roots of the impressional nerve on which it lies; and never enters its ganglionic substance, excepting at the part where its nerves are emerging for distribution, whenever the sympathetic is placed anteriorly to the spinal ganglion, certain grey filaments to that ganglion must pass in a backward and centric direction. This is the case with the prævertebral ganglia in general; their communications with the spinal nerves all seem to seek the origin of

those nerves. Knowing the necessity for arriving at the spinal ganglion, this does not prove that the grey filaments proceed so far centrally as to enter the roots.

A similar remark will apply to the encephalic nerves of common sensation, all of which receive ganglionic twigs which proceed from the sympathetic towards their origins. Thus the upward and backward direction of the large grey division of the superior cervical ganglion, which passes towards the eighth pair of nerves, is sufficiently explained by its having to reach the ganglia on both glosso-pharyngeal and vagus, and also to furnish a grey contribution to each of the petrous nerves given off close to the jugular fossa. The slightly backward direction of some, but not of all, the twigs sent to the fifth nerve by the carotic plexus may likewise be owing solely to the relative position of the Gasserian ganglion at the entrance of the sympathetic into the cranium.

The sympathetic crops out of the base of the skull, just under the anterior and inner margin of the ganglion of the fifth nerve, and pursuing its original course forwards and upwards for a short distance, must necessarily direct backwards any contribution for the ganglion. Still, even in man, these retrograde communications are few and small in comparison with the filaments which direct themselves forwards to join the distributed portion of nerve. A grey filament is never found to connect itself with a sensational nerve-root, although it may pass this in close proximity, pass also the ganglion through which the root is transmitted, and then be reflected into the ganglion. This however would merely prove, that if the sympathetic filament be destined to enter the nerve-root, it must first pass through the spinal ganglion. Hence we are reduced to appeal to the non-gangliated nerves for solution of the question. Now, if a purely motor nerve, in any case, conveyed grey filaments to its own centre, it would be most convenient for the sympathetic to furnish the supply as near to the origin of the nerve as its own position would permit. But if on the other hand the supply were for distribution only, we should expect the communication to take place at any part central to the distributed portion of nerve; to be directed *from* the brain, unless some peculiar convenience of transmission prompted otherwise; and to vary according to the relative position of parts in different animals.

In man, although the junction of the sympathetic with purely motor nerves favours the conclusion that the grey nerves do not pass towards the brain, yet it takes place sufficiently near to the origin of the nerves to be inconclusive. There is never, however, any contribution sent to the motor root of the fifth whilst within the cranium although the sympathetic lies in such close contiguity. But in animals without a neck, where there is less necessity for protecting the sympathetic during movement of the neck and face, by packing it up in the neurilem of a stronger nerve, any commu-

nication that can be distinctly made out between the sympathetic and the motor nerves of the eye, takes place within the orbit. And the long ascending branch from the first thoracic ganglion, which accompanies the vertebral artery in mammalia, might readily connect itself with the radicles of the spinal nerves, if any grey filaments were really destined to the chord. But it never does so; its communications are always made with the compound nerve external to the ganglion.

Hence, if I might depend entirely upon my own observations on this point, I should conclude that there are no grey filaments from the encephalic or the spinal nerve cells direct to the ganglionic cells, but the ganglia are only indirectly connected with either brain or chord by means of the transmitted white tubes. We may at least infer that if they exist, any such grey filaments of communication must be extremely few in number, and to be made out only with difficulty, since of the physiologists who have paid most attention to this question, and who answer it in the affirmative, Remak states that he has occasionally succeeded in detecting organic filaments in the roots of the spinal nerves. Mayer has done the same, and Bidder and Volkmann rate the proportion in which they are present in the root of a spinal nerve of a frog, whether motor or sensitive, as scarcely two per cent.

#### *Connection of the Sympathetic with the Encephalic Nerves.*

In *Fishes*, the sympathetic chain is but slightly developed, and its cerebral connections, so far as they have been demonstrated, are less extensive than in higher animals. Cuvier supposed it to be devoid of ganglia, an oversight corrected by Weber, who detected these enlargements on the sympathetic in *silurus glanis* and *lucius perca*. Their existence, however, when the sympathetic joins the spinal nerves, is not constant. Carus was the first to describe the connection with the vagus and fifth nerve in *gadus lota*, (burbot). He also states distinctly that he found small ganglia where the sympathetic connected itself with the intervertebral nerves. In the skate, Swan could not discover any cerebral connections of the sympathetic, unless its communications with visceral branches of the *par vagum* might be so considered. He describes, however, a small ganglion connected with the fifth nerve, underneath the skin of the lower jaw, near each angle of the mouth, which he considers may be homologous to the submaxillary ganglion. In the cod, there is a distinct connection between the sympathetic and the fifth, glosso-pharyngeal and vagus; no connection with the sixth; but within the orbit, a prolongation from the sympathetic, where it lies beneath the fifth, joins the third nerve, (fig. 23.) In the cat-fish, (*silurus glanis*,) Weber found the sympathetic to be connected only with the vagus; but a nerve

proceeded from this towards the fifth, and Weber had no doubt that in reality the sympathetic was joined to both fifth and eighth nerves. Cuvier supposed that the sympathetic joined the sixth nerve in the cod. This is not supported by subsequent observations; but Owen finds such a connection does exist in the carp and lump fish.

In *Amphibia*, the sympathetic has been chiefly examined in the frog, snake, and turtle. Carus and Otto could not discover a sympathetic nerve in serpents. Weber likewise failed to find any trace of it in the serpent, probably because the species dissected were too small. He found it in lizards, but was unable to make out its relations. His description of the sympathetic in the frog is very minute and accurate. The arrangement in different species is the same. Weber appears to consider the ganglion on the vagus as the encephalic extremity of the sympathetic, and describes branches proceeding from it as communications from the sympathetic. In this way he makes the sympathetic to communicate with the ganglion on the vagus by one nerve, and with the ganglion (?) on the fifth by two. Of the latter, one had previously been described erroneously by Carus as joining the sixth nerve. In the turtle, the sympathetic has an intra-cranial connection with the facial nerve and with the second division of the fifth; an extra-cranial connection with the facial, glosso-pharyngeal, vagus and hypo-glossal nerves, (Swan); and, according to Cuvier, it possesses very distinct ganglia where it unites itself to the spinal nerves by double filaments on each side of the spinal column. In the snake, (*boa constrictor*), Swan finds a distinct superior cervical ganglion, of the connections of which he gives an extremely beautiful representation in his eighteenth plate. It communicates largely with the glosso-pharyngeal; to a smaller extent with the vagus, facial, and hypo-glossal. It sends forward a long branch through a canal at the base of the skull, which joins the second division of the fifth in two places. At each point of junction there is a small ganglion, from which filaments are supplied to mouth, palate, and nostrils.

In *Birds*, the sympathetic, the glosso-pharyngeal, vagus, hypo-glossal, facial, and second division of the fifth have been found to intercommunicate in all the species which have been examined. The facial is most closely connected with the sympathetic; the hypoglossal with the vagus. The connection between the sympathetic and the glosso-pharyngeal is so intimate, that their ganglia often appear to have coalesced. This is the case in the pelican, in which Swan figures a long nerve from the ganglion homologous to the superior cervical and petrosal combined, passing forward into the orbit, where it supplies Harder's gland, and becomes connected by separate filaments with the branch of the third nerve

passing to the inferior oblique muscle of the eye, and with the ophthalmic division of the fifth nerve. The second division of the fifth receives a contribution from the sympathetic, and afterwards gives off the lacrymal nerves. In the goose, the sympathetic, the glosso-pharyngeal, and the vagus are intimately connected together. Weber figures a distinct ganglion on the glosso-pharyngeal, another on the sympathetic, but none on the vagus. Swan figures the superior cervical ganglion apparently amalgamated with that of the glosso-pharyngeal in one instance, separated from it in another.\* Bazin draws these two ganglia as distinct in the eagle; and in the ostrich, he represents a distinct enlargement on the vagus, another on the glosso-pharyngeal, and another on the sympathetic lower down in the neck, after it has emerged from the canal of the vertebral artery. In birds generally, Weber remarks the superior cervical ganglion is peculiar in the circumstance, that it receives no communicating branches from the spinal nerves, its continuation in the canal of the vertebral artery being joined by its ganglia with each root of the cervical nerves. He failed to discover the intra-cranial connection of the sympathetic with the sixth nerve asserted by Cuvier. Owen states, however, that through the aperture of exit for the vagus, sympathetic filaments pass in to join both fifth and sixth nerves.

In *Mammalia*, the superior cervical ganglion always exists as a distinct ganglion. It is variable in shape, but always elongated from above to below. It is relatively larger than in the three lower classes. It sends off towards the encephalon communicating filaments to the fifth nerve, glosso-pharyngeal, and vagus; to the sixth, *portio dura* of the seventh, spinal accessory, and hypoglossal nerves. Occasionally it has been found connected with the trunk of the third and of the fourth nerves.

It needs but a small share of practical experience with the difficulty of accurately dissecting the minute relations of the sympathetic at the base of the skull to induce us to receive with jealousy any but positive evidence concerning them. It is so easy *not* to find a given connecting filament, that its non-detection, except after repeated observation by different anatomists, is scarcely a satisfactory proof of its non-existence. Still from the sketch which has been furnished from the dissections of the highest authorities on the subject, we may glean some important inferences. (1.) As there is no distinct sympathetic nerve in the head of the skate, either ganglionic action is not essential to the functions of the encephalon; or otherwise, the function of the sympathetic may be occasionally discharged by some other gangliated nerves. That the latter is the legitimate conclusion is presumable from the alternation in point of development between the trigeminus and the

\* See his 23d plate, figs. 1 and 2.

vagus on the one hand, and the sympathetic on the other. (2.) If a cerebral ganglion can thus replace a sympathetic one, acting vicariously, there can be no essential difference in the mode of action of different ganglia. (3.) As the connection of the sympathetic with the purely motor nerves is very uncertain in its existence, and variable as to the nerves to which it relates, it cannot confer on the motor nerves anything essential to their especial function. (4.) As in every single instance where the sympathetic has been found at the base of the skull, it has been ascertained to connect itself to all the sensational nerves, such a connection does appear to be indispensable.

*Destination of the grey filaments which join motor nerves.*—The much noticed connection between the sixth cerebral nerve and the sympathetic has probably been overrated in importance. It cannot be essential to either nerve, or its existence would be universal and uniform, under similar circumstances of requirement. Weber was in error in denying its existence in the calf and the sheep. It is present, although to a much less marked extent than in the dog and cat. In these, again, it is less considerable than in man. The true reason may lie very near the surface. Where the antero-posterior axis of the skull is the longest, the sixth has to pass forwarder, before by descending towards the sphenoid, it comes into proximity with the sympathetic. But where the long axis is vertical, as in man, the sixth is the nearest nerve to the sympathetic, on the emergence of the latter from the *foramen lacerum*. In every animal, either directly, or mediately after twining round the sixth nerve, the greatest number of sympathetic filaments proceed to the divisions of the fifth nerve. Still there are some connecting filaments proper to the sixth nerve; others have been traced to the third, and more rarely to the fourth nerve, both in man and in the higher mammalia; and from the direction of these connections, it is presumable that they are intended at least in part for distribution.

In fishes, the sympathetic furnishes distinct filaments to the orbit which can be seen to enter secreting structures, or else appear to be lost in the meshes of the pellucid areolar tissue. They cannot be traced into the orbital muscles. Hence, it would seem that grey sympathetic filaments are wanted for the other soft textures in the orbit, but not for the ocular muscles. In man also, the muscular nerves of the eyeball give off extremely minute filaments, which are apparently lost in the surrounding areolar tissue. As these motor nerves are usually unmixed with sensational fibres,\* the filaments referred to are probably ganglionic; motor, from their distribution, they cannot be. Every gland having a special

\* A common exception is when the fifth and sixth have previously communicated within the skull.



relation to some other part, has usually an especial ganglionic supply for the purpose of maintaining that relation. The adipose and areolar tissue undergo change of nutritive action in response to the system at large, and to the local activity of contiguous parts; but they have no particular functional relationship to any special processes occasionally or periodically called into play. Hence they need no especial ganglia, but are supplied by the sympathetic sufficiently to bring them in unison with the existing condition of the system at large.

As regards the orbit then, minute anatomy has shown that the areolar tissue occasionally receives filaments from muscular nerves; but has not by the microscope demonstrated the character of these filaments. Comparative anatomy proves that the sympathetic sometimes does, and sometimes does not furnish grey fibres to the ocular motor nerves; and that in the latter case, it invariably sends grey filaments directly to the areolar tissue in the vicinity of the muscles which the motor nerves supply (*e. g.* various fishes). As we cannot doubt but that the orbital muscles are just as energetic in their nutrition and muscular action (? the same thing), where they have not received filaments from the sympathetic, as where they have, the supply is probably not destined for the muscles, even when it is enclosed in the sheath of the motor nerves. The white motor nerve-tube may possibly stimulate the grey unisolated filament as the two pass together in close proximity, and thus secretion in the cells of the surrounding areolar tissue may proceed *pari passu* with the action of the muscle; or, the grey filament may merely join the stronger nerve-tube for convenience of packing and transmission. The blood-vessels and the glands in the orbit being furnished with organic nerves in another way, the supply is not likely to be for them. The adipose and areolar tissues alone remain. Both are secreting structures; and both, as shown in other parts of the body, are influenced greatly by the system in general.

It is difficult to adduce pathological proof that the nerves can directly modify the secretion in the fat, and in the areolar tissues. In the local œdema around an inflamed part, we cannot ascertain how much of the increased exhalation in the areolar tissue is due to the mere physical obstruction of over-distended blood-vessels, and how much to disordered innervation. In the dropsy of anæmia, how much to mere transudation of too thin blood, and how much to an impairment of those nervous reactions which, in the higher animals, seem to be essential to vigorous health. In the œdema of cancer, and of *morbis Brightii*, how much to a morbid condition of blood irritating the organic and other nervous centres, and how much to general dyscrasy. Hence, in these cases, the rationale being purely conjectural, the most obvious is the most received. The mechanical influence of gravitation in producing

swelled legs where the system is greatly enfeebled ; of pulmonic, cardiac, or hepatic obstruction, in causing their various forms of serous effusion, is reasonably referred solely to the physical condition of the blood-vessels and their contents, irrespective of nervous agency. But when the hemiplegic side in a case of palsy becomes oedematous, and the oedema is accurately limited by the mesial line, what gives the limit ? Granting an alteration in the state of the capillaries of the palsied side, the vessels can only be sufficiently affected through the medium of the nerves. The vessels do not end abruptly at the median plane ; the nerves do. In severe hemicrania, the eyelids on the affected side will sometimes become oedematous, whilst those on the other side remain unaffected. The over free application of nitrate of silver to a single point of the uvula will often occasion instant oedema of the whole. Strong applications in gonorrhoea will sometimes have a similar effect on the prepuce. The oedematous wheals of severe urticaria, and the puffy swellings almost instantly occasioned by the sting of an insect, are other instances of effusion into areolar tissue, hardly to be explained without admitting the direct influence of the nervous system over the natural secretion. Mere mechanical exudation from over-distension of vessels is not sufficient. The eyelids contain more blood in conjunctivitis, the uvula in tonsillitis, the prepuce in chordee, the skin in measles, without any such oedema ; and it occurs, too instantaneously, to be so explained.

As regards adipose tissue, it is not to be supposed that any action of the nerves can cause the deposition of fat from blood not fitted by its chemical composition to lay it down. But nervous irritation is well known to check this, whatever the condition of the blood, to an extent beyond what its obvious interference with the state of digestion, circulation, and respiration, and muscular action will account for. Probably, however, of all the soft tissues, fat is least under the direct influence of the nervous system.

Until we know how the organic nerves terminate, and their mode of action on the parts under their influence, it is no real objection that the grey filaments assumed to preside over secretion, in adipose and areolar tissues, appear few in proportion to the extent of the textures they supply.

*Destination of the grey filaments which join sensational nerves.*

—All reasoning on this question must be inferential ; nothing has been demonstrated. Even if we could satisfactorily trace the precise relations of the grey filaments in the peripheral terminations of impressional nerves, which has not yet been accomplished, we could not possibly ascertain whether a given grey filament had its origin in the spinal, or in the sympathetic ganglion, which are

both so intimately related to the nerve trunk. Having no reason to suppose, as already remarked, that one ganglion acts differently to another, we infer that the sympathetic has no occasion to furnish grey nerves to the same points of structure already supplied by a gangliated impressional nerve. All purposes of general harmony will be sufficiently fulfilled by the nerve-tubes which connect the cells of the sympathetic with those of the spinal ganglion. If so, the peripheral contribution, which the sympathetic supplies to every impressional nerve, will not be distributed to the same parts as the terminations of the impressional nerve. We have, therefore, to inquire in each instance what organic processes in the part are functionally associated with the action of the impressional nerves, and what are not. The former will be superintended by the spinal ganglia, the latter by the sympathetic. Many such processes being at the same time connected with impressions and with muscular movement, are presided over by the sympathetic ganglia especially appropriated to them. The addition of the motor element makes the distinction.

#### *Classification of the Ganglia.*

- A. Simple ganglia; always offsets from compound sympathetic ganglia; uncertain in their seat. Single, containing the ganglionic element only.
- B. Compound Ganglia.
  1. Spinal.
  2. Sympathetic.
    - a. Fusiform ganglia.
    - b. Distinct ganglia.
1. Spinal ganglia; always formed on the roots of impressional nerves; neither giving nor receiving distinct nerves except at their peripheral margin; never connected with a motor nerve. Double, consisting of the ganglionic and of the impressional nerve elements.
  1. All the intervertebral ganglia.
  2. The Casserian ganglion.
  3. The superior ganglion of the vagus.
  4. The superior ganglion of the glosso-pharyngeal.
2. Sympathetic ganglia; never found on the roots of cerebro-spinal nerves. Triple, consisting of the ganglionic, of the impressional nerve, and of the non-volitional motor nerve elements.
  - a. Fusiform ganglia; always found imbedded in the course of a nerve-chord.
    1. The inferior ganglion on the glosso-pharyngeal.
    2. The inferior ganglion on the vagus.
    3. The superior ganglion on the *portio dura*.
    4. The inferior ganglion on the *portio dura*.
    5. The ganglion on the inferior maxillary nerve.
  - b. Inconstant.
    1. A fusiform ganglion on the *ramus auricularis* of the vagus.
    2. One on the *chorda tympani*.
    3. One on the Vidian (?)
3. Distinct ganglia, placed on nerve-branches, never on the roots or main trunks, receiving and furnishing nerves in any direction.
  1. Ribes's ganglion (?)

2. Carotidean ganglion.
3. Ophthalmic.
4. Otic.
5. Spheno-palatine.
6. Submaxillary.
7. All the prævertebral ganglia.

Holmes Chapel, Cheshire,  
May 28th 1847.

*Description of the Plates I., II., and III. to Essay on the Ophthalmic Ganglion. Vol. lxvi. p. 312.*

All the figures are represented as seen under a magnifying power of 300 linear diameters.

PLATE I.

Fig. 1. Various appearances of nerve-tubes in grey part of spinal chord of sheep.

a. Two views of the same nerve-tube. In one the compression was increased so as to displace vesicles which previously concealed the portions of tube proceeding from the sides of the bulbous dilatation.

b. Isolated translucent varicose tubes.

c. A single nerve-tube forcibly compressed and rubbed; showing the difference between the appearance thus occasioned and that presented by the varicose nerve-tubes.

Fig. 2. From brain of chub.

a. Nerve-tube with its dilatation imbedded in grey cells.

b. The same, the cells having been displaced; showing that the apparent termination of a in a bulb was fictitious.

Fig. 3. A caudate vesicle from brain of common eel.

Fig. 4. From spinal chord of eel.

a. Varicose nerve-tubes.

b. A single varicose tube forcibly squeezed.

Fig. 5. From optic lobes of brain of water-hen.

Fig. 6. From *corpus striatum* of rabbit.

a. Ring-like arrangement of tubes and vesicles.

b. Irregular junction of tubes and vesicles.

PLATE II.

Fig. 7. Vesicles and tubes from vagus ganglion of rabbit, isolated accidentally on object-glass.

Fig. 8. Other objects singled out in the greyer part of the ganglion.

Fig. 9. Vesicles and tubes from centre of celiac ganglion of rabbit.

Fig. 10. From Casserian ganglion of rabbit.

Fig. 11. From a spinal ganglion of rabbit.

Fig. 12. From another spinal ganglion.

Fig. 13. Do. accidentally isolated.

PLATE III.

Fig. 14. Various appearances of objects from grey portion of the pituitary body of rabbit.

Fig. 15. Do. from celiac ganglion of foetal kitten.

Fig. 16. From a ganglion of the sympathetic lying on psoas muscle of rabbit.

Fig. 17. Objects seen in sympathetic ganglia of a human foetus at the fifth month.

PLATE IV.—*Diagrams made from Nature.*

Fig. 18. Sympathetic ganglion in the cat, corresponding to the infe-

rior cervical of the left side. Shows the different distances from the chord at which the *rami communicantes* are connected with the cerebro-spinal nerves; the difference in the size of these rami, and in the proportion of grey and white fibres which enter into their composition.

C. 3, 4, 5, 6, 7. Five lowest cervical nerves with their posterior gangliated roots.

D. 1, 2, 3. Three highest dorsal nerves.

a. Middle cervical ganglion and descending chord of sympathetic.

b. Large ganglion lying in front of the head of the first rib, and receiving communications from the first and second intercostal nerves, and from the five inferior cervical nerves. The *ramus communicans* to the lowest cervical nerve being the shortest, thickest, and by far the greyest.

c. A lash of almost entirely grey fibres which expand in a fan-like manner as they approach the cardiac plexus.

d. Bundle of axillary nerves turned up.

e. Ganglionic branch which accompanies the vertebral artery in its canal, is connected by filaments to each of the cerebro-spinal nerves in its vicinity, and is said to supply filaments to every branch of the artery.

f. The first dorsal ganglion of the sympathetic after the large one b.

Fig. 19. The angle where the *ramus communicans* is joined to the seventh cervical nerve, magnified fifty times. There is no attempt at accuracy of representation as regards the dimensions of the nerve-fibres, or their relative number. The diagram is intended to illustrate the difference in the course of the grey fibres on arriving at the nerve; one bundle directing itself towards the spinal chord (C. centrad); the other diverging and accompanying the white nerve-tubes towards their destination (P. peripherad). Only two larger nerve-tubes are represented in the *ramus communicans*. This is merely for the sake of clearness. In reality, there exist many such, although the ganglionic fibres greatly preponderate.

Fig. 20. Ophthalmic ganglion in the ox. Showing the great shafte which the third nerve has in its formation; also, that the branch furnished by the fifth really does proceed from the Casserian ganglion, and that it cannot consist of grey filaments merely given off from the ophthalmic ganglion to accompany the nasal nerve to its distribution.

C. G. Casserian ganglion.

2, 3, 5. Second, third, and fifth cerebral nerves.

a. Ophthalmic ganglion.

b. Sensational root of do. dividing into

c. Ganglionic branch; and

d. Non-ganglionic ciliary branch.

e. Ganglionic ciliary nerves.

f. A wandering branch of that part of the third nerve which supplied the *rectus superior*.

g. A slender nerve lost about the inner canthus. The two last (f and g) for short distance from the ophthalmic ganglion were enclosed in the same neurilem, and appeared to be traceable across the surface of the ganglion into the most anterior branch of c.

#### PLATE V.

Fig. 21. Connection of the sympathetic with the cerebral nerves in the young puppy-dog. Showing that the general direction of the communications, taking the sympathetic as their chief origin, is from behind forwards.

3, 4, 5, 6. Third, fourth, fifth, and sixth cerebral nerves. A communicating branch passes between the ophthalmic division of the fifth and the sixth.

8. Eighth nerve.

Sp. A. Spinal accessory.

V. G. Vagus ganglion.

S. C. G. Superior cervical ganglion of the sympathetic; all its communications external to the skull destroyed.

V. Inferior vidian nerve receiving the superior vidian.

Fig. 22. Another dissection in the dog.

5. Fifth nerve—ophthalmic division.

C. G. Casserian ganglion.

6. Sixth nerve with its communication from the fifth.

S. Sympathetic sending a large grey contribution beneath the ganglion of the fifth to join its three great divisions just at their origins; and also, largely connected with the sixth.

Fig. 23. Connection of the sympathetic with the fifth and third nerves in the cod-fish. Showing that the sympathetic comes very forward before effecting its junction, and implying that it supplies filaments to the third nerve for distribution only.

3. Third nerve.

5. A large root of the fifth turned up.

S. Sympathetic nerve.

C. G. Casserian ganglion, with a large supply of sympathetic filaments entering the origin of the nerves which proceed from it.

C. A. Ciliary artery.

C. N. Ciliary nerves.

S. C. Sympathetic ciliary nerve-trunk, proceeding from the ganglionic mass beneath the ganglion of the fifth; becoming connected to the third nerve within the orbit; intermingling with the filaments of the third nerve to form the ciliary nerves, but not forming an ophthalmic ganglion.

#### PLATE VI.

Fig. 24. Diagram of the spinal nerves of the cod-fish, taken from upper part of dorsal chord, where the body of the fish is largest, and where the difference in size between dorsal and ventral nerves consequently is most considerable. The arches of the vertebræ are supposed to be removed, and the upper aspect of the *medulla spinalis* exposed.

D. D. D. D. Four dorsal nerves, destined to ascend vertically towards the dorsal fins. Each is composed of a non-gangliated fasciculus from the posterior root (2), and of a motor root (also non-gangliated,) which descends from the anterior root of the nerve next above it (1.) Hence each dorsal nerve derives its posterior root from a lower segment of chord than that which furnishes its anterior root.

V. V. V. V. Four ventral nerves, very large, passing beneath the muscles and gaining the inner surface of the walls of the abdomen. Each consists of an anterior root, and of a gangliated posterior root, which arise from the chord on the same transverse level.

L. Lateral nerve composed of both gangliated and non-gangliated portions of the fifth nerve, and to a small extent of nerve-fibres from the vagus. It crosses the dorsal nerves at right angles, communicating with each. No ganglion exists at the point of conjunction. The nerves to the dorsal fins (*locomotive gills*?) are thus made up of fifth and eighth, (compound, sensational and motor; gangliated and non-gangliated;) and of spinal fibres from both roots, but neither of them gangliated.

1. 1. Anterior roots (cut off) of dorsal nerves.

2. 2. Posterior roots of the same, diverging from the other fibres of the posterior roots before (i. e. spinad,) these enter the intervertebral ganglion.

3. A compound ventral nerve, the antero-dorsal nerve (1\*) cut short to display the splitting of the posterior roots through which it passes, and the ganglion which, before displacement, it covers and conceals.

4. The next ventral nerve, with a portion of its posterior roots removed, in order to expose the anterior root, giving off before its conjunction the antero-dorsal branch.

5. Another ventral nerve in its natural state.

6. A ventral nerve cut short at the point where the anterior root enters the same sheath with the posterior, (i. e. distal to the ganglion.)

#### PLATE VII.

Fig. 25. Displays the decussation of the anterior portion of the two sensational columns in the *pons varolii* of the sheep.

#### PLATE VIII.

Fig. 26. Displays the oblique direction of the decussating sensational fibres on leaving the *pons varolii* on the left side in the dog. Also, a more complex arrangement of parts on the anterior aspect of the *medulla oblongata* than is usually described.

#### PLATE IX.

Fig. 27. Displays the non-decussation of the posterior portion of the sensational columns in the dog. Also the complex arrangement of parts on the posterior aspect of the *medulla oblongata*, especially with reference to the cerebellum.

*Cure for Cramps.*—(In a Letter to the Editor from S. ARGENT BARDSLEY, M. D. formerly Senior Physician to the Royal Manchester Infirmary.)—SIR, I feel anxious to communicate, through your able and widely-extended Journal, my discovery for the relief of a most distressing complaint, viz. the very severe and habitual cramps which afflict many persons in bed during sleep. Having myself been for many years (up to my 82d year of age) a martyr, almost every night, to this torturing malady; and having tried in vain many of the "thousand and one" remedies usually prescribed for relief, I was at length led to reflect upon a fact, which had hitherto escaped my attention, viz. while sleeping in a chair with my lower limbs, if not touching the floor, yet so depending as to form an inclined plane with the whole of my frame, that I was, in this position, never disturbed by cramps; and upon inquiry, I found other sufferers, from habitual cramps, were under the same predicament.

These facts, in connection with some physiological considerations (not necessary here to mention), induced me to put in (November 1846) practice the following plan, which, after a trial of five months, has proved decidedly successful, by an arrangement of the mattresses,—or by increasing the height of the upper part of the feather bed, by removing the feathers from the lower extremity, so as to procure the due inclination of twelve inches. I deem it absolutely necessary to give a caution to sufferers from cramps, that the disorder is almost always connected with a weak or imperfect state of the digestive organs; and therefore, although the method now stated for relief will allow the sufferers several luxuries hitherto forbidden; yet there must be limits placed to such indulgences, if they expect to pass the nights entirely free from their malady. I am desirous to add, that among several other reports of success, two gentlemen of Manchester, within the last week, have informed me of their cures from habitual cramps by the use of the inclined plane.—Your obedient servant, SAMUEL ARGENT BARDSLEY, M. D.

*The Orchard, Greenheys, N. Manchester, April 21, 1847.*

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## PART II.

### CRITICAL ANALYSIS.

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- ART. I.—1. *Parliamentary Accounts and Papers.* (25) *Quarantine Regulations.* Session, 2d February—24th August 1843. Vol. liv. folio. Pp. 568.**
- 2. *Rapport à l'Académie Royale de Médecine sur la Peste, et les Quarantaines, fait au Nom d'une Commission par M. Le Dr Prus. Accompagné de Pièces et Documents et Suivi de la Discussion dans le sein de l'Académie.* liere et 2de Parties. Paris, 1846. 8vo. Pp. 663.**
- 3. *Correspondence respecting the Quarantine Laws since the Correspondence last presented to Parliament. Presented by Command to the House of Commons in pursuance of their Address of May 1846.* London (46.) Folio, Pp. 48.**

IN December 1846, the schooner *Charles Napier*, of Southampton, bound from Faro with a cargo of oranges, picked up, on her homeward voyage, ten men, the master and crew of the *Siren* of Sunderland, from Kertsch, with linseed, which vessel they had abandoned. The *Charles Napier* arrived in Southampton Water in January with sixteen persons on board,—her own crew and that of the *Siren*. She was obliged, by the quarantine regulations, immediately to proceed to the Motherbank with all on board and the pilot, there to remain until the time prescribed by the quarantine laws had elapsed, because she had on board ten persons who had been aboard a vessel which had sailed from Kertsch. The master or owners of the *Charles Napier* were not only put to additional expense for the subsistence of so many persons during detention; but the crew were confined many days, in sight of shore, without the power of communicating with friends or anxious relatives, after a voyage tedious, lengthened, and laborious, and during the most stormy season of the year; while the cargo, a perishable one, was liable to the chances of great deterioration. Kertsch is a port on the north coast of the Black Sea, on the west side of the channel by which it communicates with the Sea of Azof, in  $45\frac{1}{2}^{\circ}$  N. lat.,  $36^{\circ} 20'$  W. long. from Greenwich. We are not informed where the *Charles Napier* met with the wrecked *Siren*. But the latter must have sailed across the whole breadth of the Black Sea, down the Dardanelles, across the Archipelago, down the Mediterranean, and through the Straits of Gibraltar, before she could come on the tract of the former.



The Ripon steam-vessel from Alexandria, with many passengers and a general cargo, among which are silks, mohair, yarn, and similar articles, touches at the Motherbank, and is allowed to pass on, without let or hindrance, to disembark her passengers and cargo.

The fact now detailed is one only of many which are taking place almost every week in different parts of this island or its colonial dependencies. Were we to enumerate all the similar occurrences and examples of irregular and oppressive application of the quarantine laws, the list would fill half of any number that we publish. One fact, however, is the model of one thousand, and illustrates the mode in which these laws are administered as forcibly and clearly as five hundred.

Such is one of the effects of the unequal operation of the quarantine laws. What there might be in the cargo of the sailing vessel, or the persons and clothing of her crew, more capable of retaining and communicating infection than in those of the steam-vessel, it seems by no means easy to determine. Linseed, with which the abandoned vessel was loaded, may be more retentive of pestilential germs than mohair, silks, and yarn; but if it be, it seems not easy to understand why. The vessel, also, had been deserted; the crew probably well and sufficiently washed in salt water before they were received by the *Charles Napier*; they must all, at all events, have been as well ventilated as the most fastidious and scrupulous expurgators could desire. Yet this is not enough for the administrators of the quarantine laws. The mariners of both vessels are subjected to a second ordeal of detention, inspection, expurgation, and disinfection; and, along with this unfortunate crew, the not less unfortunate master and crew of the *Charles Napier*, and all because the latter performed a humane duty in rescuing ten fellow creatures from a death which, if not speedy by the violence of winds and waves, must have been lingering and painful by cold, hunger, and starvation.

It is perfectly clear to demonstration, that the dread of infection and contagion cannot be the cause of this irregularity; for, were that the case, then the Ripon ought to have been detained as well as the *Charles Napier*. It must have been some other cause, for which the search will be vain and ineffectual amidst the confused ideas and contradictory doctrines maintained by quarantine legislators and quarantine law administrators.

On the utility and expediency of these laws, some doubt may be entertained. On the bad effects resulting from their unequal operation and irregular application, it is quite impossible to entertain any doubt whatever. One of the great points here, however, entirely kept out of view, is the fact, that even were the disease as strongly contagious, and as easily propagated by contagion, as one of the facts now related would imply, it is regarded by the other as either void of contagious properties, or at the

time incapable of being communicated in this manner. Another circumstance is this, that, supposing the disease to be often contagious and propagated by contact, it is proved beyond all possibility of doubt, that, for its propagation in this manner, a peculiar state of the atmosphere must concur; and that unless this state of the atmosphere be at the same time present, cases which arise spontaneously do not produce other cases.

This fact or law, which has been admitted as established by the evidence of all observers, and which is quite as necessary to the doctrines of those who deny contagion, as to those of the party who maintain that principle, has led to the distinction of plague into two sorts or varieties; one the endemic and sporadic form, the other the epidemic form of the disease.

A question of some importance proposes itself here for consideration. This is, whether plague has always shown itself with the same characters when it has been observed epidemically as when it is observed to arise spontaneously. Unless it can be proved that epidemic plague presents the same nosological characters as the endemic disease, it is manifest that it is impossible to reason on the subject as if they were the same disease. If they are different diseases, or even different forms of the same disease, then plague may be endemic without being contagious, and it may be contagious in a locality into which it has been imported, yet may not be endemic.

It is to the solution of this question among others that the reporters apply themselves in the second part of their report. Has plague, it is asked, always appeared with the principal characters of epidemic diseases, when it has raged violently in Africa, in Asia, and in Europe. To furnish the means of determining this point, the reporter first gives the characters of epidemic diseases, then he inquires whether the plague presents all these characters.

Epidemic diseases, by which are meant those which attack many individuals in a given time, present peculiar characters, by which they are distinguished from diseases not epidemic.

1. Their progress presents a particular course. They in general present three periods; the period of commencement, the period of height or establishment, and the period of decline or termination. These three periods present neither the same symptoms, nor the same lesions, nor the same severity.

2. During the prevalence of an epidemic disease, other diseases are less numerous, and they receive the impression of the prevalent disorder.

3. When an epidemic disease prevails, it is unusual for persons who preserve their health, not to feel more or less the general influence.

4. Epidemic diseases return and cease often in the same season, and have in general the same duration.

And 5. An epidemic disease is often preceded by other affections more or less severe, more or less generalized, which act in some respects as its forerunners.

First are to be considered the three periods above mentioned.

Schenke relates that when the black plague first spread in Europe in 1348, this disease was fatal in the space of three days, and no one could cure it. In subsequent and later periods of the epidemic, buboes appeared in the groins and arm-pits; and the disease was then less violent and less fatal. Chenot also observes that plague, when it breaks out in any locality, is most rapidly mortal; while in subsequent periods, it becomes less violent, and terminates much more frequently in recovery. The same was observed of the plague of Marseilles and Toulon in 1721; the plague of Moscow in 1771; that of Cairo in 1800; and, in short, of all plague epidemics; and the fact is admitted by Brayer, Clot-Bey, and in short, all those who have observed plague epidemics in their origin, progress, and termination.

The second circumstance, that epidemic diseases, while they prevail, cause the disappearance of other diseases, or communicate to them their epidemic character, is not less certainly established; and though the facts given by the reporter sufficiently prove this character, yet they are neither so uncommon nor so little known as to justify repetition in this place.

In like manner, persons who escape a positive and marked attack of the epidemic feel, nevertheless, various symptoms of disorder, which demonstrate the universality of the epidemic influence. Thus various persons complain of pains in the groins and arm-pits, as if they were to be attacked by buboes; others complain of pains in other parts, as if indicating the formation of carbuncles; and others have headach, loss of appetite, bad taste in the mouth, and fits of faintness, as if the pestilential poison were operating, in an imperfect manner and in diminished dose, upon their organism. It is well known that during the prevalence of epidemic cholera in various countries of Europe, in 1832 and 1833, many of those who escaped had disorders of the stomach and bowels, colic pains, slight attacks of diarrhoea, and similar ailments.

On the question of the fourth character assigned to epidemic diseases, that they have always nearly the same duration in different countries, and that in certain countries they begin and terminate at periods previously capable of determination, facts seem to be not less decided and abundant. And on the fifth character of epidemic diseases, that they are often preceded by other affections more or less severe, and more or less diffused, which serve as their harbingers, the reporters answer equally affirmatively.

The subject next demanding consideration is the causes of pestilential epidemics. These causes are of two orders; the first belong to the soil and the atmosphere; the second relate to the physical and moral dispositions of the population of the countries.

The reporter reminds the Academy, that when Dupuytren demanded of the young Egyptians who were brought to that assembly by Clot-Bey, after they had obtained the title of doctors in medicine from the Faculty of Paris, what was the opinion of the most enlightened men in Egypt on the origin of the plague, they answered, "the plague proceeds from the ground;" meaning thereby, that a moist marshy soil more or less covered with animal and vegetable matters in putrefaction, is a powerful cause of changing the air, and thereby of inducing plague.

To show the influence of terrestrial conditions in the production of the disease, the topography of Damietta is contrasted with that of Fayoum, from the account of Dr Rossi.

Fayoum is raised above the level of the sea; Damietta borders the sea-coast. At Damietta the air is hot and moist; at Fayoum it is hot but dry. Fayoum is exempt from marshes; Damietta is surrounded by marshy pools formed of fresh and salt water. At Damietta the cemeteries are within the town; at Fayoum they are remote from the dwellings of the inhabitants. At Fayoum, the water, though not exquisite, may be drunk without inconvenience, by reason of the nitre which it contains in abundance; at Damietta, the fresh water is mixed with sea-water, or it is defiled by excrementitious products, and by putrefying animal and vegetable matters. Fayoum is surrounded by the desert of Lybia; Damietta is surrounded by rice-fields, and situated in front of the formidable Delta. Now, though these two towns belong to the same country, are under the same government and laws, and are inhabited by the same people; yet in one, viz. Damietta, the plague is endemial, while the other is exempt from the disease, though often persons affected with plague come thither to die.

It is scarcely possible to imagine a stronger proof of the fact, that the formation of plague depends on local causes, much more than on contagion or importation. If, indeed, to this be added the analogous fact, that plague is never observed to be developed in Upper Egypt, it must be admitted that strong reasons are afforded for calling in question the influence of the latter cause.

Atmospherical variations exercise great influence on the development and progress of pestilential epidemics. Larrey, Pugnet, and all the physicians who succeeded them in Egypt, observed that the attacks are more numerous, and the mortality greater, when the air is hot and moist, than when the weather is tempestuous. At Constantinople, the same causes produce the same effects.

The reporter also adverts to the uniform and long continued condition of the meteorological constitution, noticed by Humboldt and many other observers. Thus, in speaking only of plague, it is after long continuance of the same winds, the same tempera-

ture, that observers have most commonly observed epidemic plague spring up in Egypt, in Syria, and at Constantinople. It may be conceived, he argues, that when a population have lived for a long period in the same conditions of climate, atmosphere, alimentation, and other physical conditions, the organisms become deeply modified in the same manner, and are disposed to receive or even to develop the disease.

It may be further observed, that both with regard to epidemic visitations of plague and yellow fever, the atmosphere is unusually still, calm, and little disturbed by winds; and as to plague, at least in general, when it is most violent and general in its attacks, the air is often little disturbed by currents for weeks. When at length the Etesian, or north winds, have begun to blow at the stated 24th of June, the disease suddenly abates greatly; new cases are no longer heard of, and in a few days it is extinct. Though the same accuracy is not observed as to yellow fever, yet it has been remarked, that so long as the atmosphere remains calm, still, and little disturbed, cases continue to take place, and mortality proceeds. If, however, a hurricane or tornado arise, a sudden stop is put to the disease; some of the sick speedily become well; and, for a time at least, the progress and violence of the epidemic are temporarily suspended. It is only, however, when the temperature falls considerably, a change of wind sets in, or rain descends, that the disease begins to subside, and disappears for that season.

To this influence and modification thereby of the organisms of the population, the reporter attaches very great importance; in short, a degree of importance in which, we think, he will get few dispassionate observers to follow him. He seems to think, for instance, that the organisms of the natives of different countries are so much and so deeply imbued with this influence, that when a pestilential epidemic is prevailing in any given country, it may affect the systems of the natives of that country, though at a distance and in different conditions. It seems as if he believed that there was, between the epidemic constitution and the temperaments of the inhabitants of a given country, some secret chain or link of communication, by which the disease was made to affect these persons, and these only, amidst many other masses of human beings.

"One remarkable fact," he says, "observed in several epidemics, and which has been denied because it was impossible to explain it, might thus be explained, and might perfectly confirm this truth, namely, that individuals who have long been subjected to the same influences may be attacked by the same disease at a given period, though at this time they might be stationed in different countries and placed in different conditions."

Diemerbroeck knew several families whose members, though remote from each other, had been attacked by plague at the time

at which this disease was prevailing, in places where these families were dwelling. He specifies this coincidence with regard to the family Von Dams of Nimeguen. "The father, dreading the plague as to two of his children, sent them to Gorcum in Holland. The third remained with him at Nimeguen. The two children who were at Gorcum, where there was no plague, remained for three months in perfect health. But all at once they were attacked with plague, and died at a period not distant from that at which the father and the third child fell under the disease at Nimeguen."

In this fact, if it happened as related, we see nothing very remarkable. The latent period, or what may be called the period of incubation in plague, is not well known. But there is reason to believe that it varies in different individuals; and that, supposing the disease to depend on the operation of a poison developed at, or evolved from a particular locality, it may take in one person one month, in another six weeks, and in a third two months, to mature itself so as to form the complete disease. There is surely nothing very extraordinary in observing, that two children, who had been exposed to the air of a locality where plague was prevailing, should, when removed from that locality, have been, after the lapse of a certain time, attacked by the disease. It is quite possible that, before quitting Gorcum, these children had imbibed a sufficient dose of the poison to have their systems affected, whether they had been removed from, or had remained in the locality. The susceptibility of a certain family or temperament may be admitted, without in any degree supposing that there is in the organisms of the natives such a condition, as renders plague more likely to attack them, even in a distant locality, than the persons among whom they are residing.

The reporter, however, has other anecdotes which he adduces as facts confirming the same inference. Evagrius, he tells us, speaking of an epidemic of plague which reigned at Antioch, thus speaks: "A circumstance truly astonishing is, that when the inhabitants of a city desolated by the epidemic were absent, and in places where the disease was not prevailing, they alone were attacked by it." Procopius also, treating of the plague of 542, thus expresses himself: It infected with its poison, in a healthy city, persons who were born in that in which it was prevailing. Senac also states that the English, at a season when plague was prevailing in England, were attacked by it even in foreign countries. This fact he tries to explain by stating, that the relation of parentism is a sort of contagion.

These facts, if such they are to be viewed, it would be idle to explain, until we know that they are facts. Their accuracy we altogether doubt; and it appears to us no improper stretch of incredulousness to do so, unless better evidence of their truth is afforded. We decline, indeed, attaching importance to any state-

ment made by Evagrius and Procopius, unless supported by collateral authority.

Of a similar tendency is another statement given by the reporter. The epidemic action varies in certain circumstances according to the race. Thus he tells us that negroes have a peculiar predisposition to be attacked by plague. The following statement is quoted from a report by M. Penay to the Council of Health at Cairo on the plague of 1841.

"Towards the close of the month of May 1841, a passage-boat descending the Nile had ten black slaves at Nadder, while plague was raging there. The day after their arrival most of the slaves were ill; some died the same evening; others during the night. The master quitted the village of Nadder, carrying with him the rest of the slaves, who died before debarkation at Kafr-Regard. It deserves attention, that neither the crew nor the other passengers who loaded this vessel, and were mixed indiscriminately with the pestilential persons, were attacked by the disease."

Not one syllable of information is here given as to the state of the slaves; the manner in which they were fed or sheltered; their clothing; their general condition; or the moral state of persons forcibly and violently dragged from their homes and relatives. On all these points a decent and profound silence is observed. Of one thing only we may be certain. Their treatment would be neither kind nor merciful.

M. Aubert-Roche gives the proportion and amount of mortality in different nations in the great Alexandrian Plague of 1835. The following is the table.

|                      |              |                       |
|----------------------|--------------|-----------------------|
| Negroes and Nubians, | 84 per cent. | 1528 in 1800 persons. |
| Maltese,             | 61 ...       | 367 in 600 ...        |
| Arabs not soldiers,  | 55 ...       | 10,936 in 20,000 ...  |

The negroes, Nubians, and Arabs, it is added, were living nearly in the same hygienic conditions. All were in free pratique.

As to the rest of the population of Alexandria, the conclusion to be drawn from the numbers is less certain, he allows, considering that the conditions of isolation and hygienic position were not the same for all. Here, however, are the numbers:

|                                                                     |                             |
|---------------------------------------------------------------------|-----------------------------|
| The Greeks lost                                                     | 14 per cent. or 257 in 1800 |
| The Jews, Armenians, and Copts,                                     | 12 per cent. or 482 in 4000 |
| The Turks,                                                          | 11 per cent. or 678 in 6000 |
| The Italians and other inhabitants of southern countries of Europe, | 7 per cent. or 118 in 1600  |
| The French, English, Russians, and German,                          | 5 per cent. or 52 in 1000   |

It is quite idle to reason on these numerical proportions and statements, without knowing much more of the relative position, social and physical, of the members of these different nations. So much depends on modes of living, means of accommodation, the district in which the persons reside and sleep, and other circum-

stances, that, without very ample information on all these points, it is evidently absurd to speak of the influence of the pestilential poison in different nations and tribes of men. Only one remark, we add, on the alleged hygienic conditions of the Negroes, Nubians, Maltese, and Arabs. They are all almost, with little exception, labourers and porters, working in the sun, at times very hard and laboriously; getting little for their labour, and that not steadily; living badly; sleeping in wretched situations, often on the ground and near the quays; and drinking strong liquors when they can procure them.

The converse of the proposition already stated is however also observed. Thus strangers passing through or residing in a city visited by plague, remain free from its attacks. Thus, in a plague which prevailed at Copenhagen, the English, Dutch, and Germans escaped the disease. In other circumstances, again, strangers are more affected than natives. In the year VII. (1798,) when plague reigned at Damietta, the Turks, who then constituted two-thirds of the population of the town, underwent only 8 attacks among 100, which affected the French and the Greeks.

The resisting force to the action of epidemic causes of plague varies according to family, sex, age, professions, mode of life.

The general conclusions are the following.—

1. Epidemic plague attacks many individuals at once.
2. In the different latitudes in which the disease has appeared, it has presented periods of commencement, establishment or height, and of decline.
3. During its prevalence, other diseases become greatly more rare than usual, and are almost always stamped by its characters.
4. In periods of plague, the epidemic influence is felt by persons who have formerly had the disease, and even by those who have not had it, and who retain health.
5. In Egypt, Syria, and at Constantinople, it has been possible to determine the periods of invasion of pestilential epidemics, that of their increase, and that of their termination.
6. Epidemic plague has been often preceded, and its approach, as it were, announced by other epidemic disorders.

Whatever may be the fact as to the existence and operation of contagion, it is certain that the disease, in epidemic constitutions, is often propagated without any evidence of that agent. It must be admitted that the atmosphere of certain localities becomes, as it were, impregnated with the active principles of the distemper; and that, for some time at least, this atmosphere alone is capable of communicating the disease. This it does, not by causing the disease to pass from one person to another, but by affecting several persons, not in communication, simultaneously or successively, according to their susceptibility, and according to the doses of the poison which they have respectively imbibed.



The local atmosphere, in such circumstances, is an epidemic focus of infection ; and every individual remaining in it is liable to contract the disease. Numerous and authentic facts observed in Egypt in 1835 and 1841, proved that the most complete isolation, the most rigorous quarantine, do not always preserve those who are subjected to it. The same remark was made as certainly at Marseilles and Toulon, during the great plague of 1721.

If this be the fact, it follows that removal from the impregnated atmosphere, if early practised, must save those who do remove from it. Numerous facts accordingly are recorded by writers on plague epidemics, of persons who, having quitted plague-stricken cities, have escaped and not been attacked by the disease. It is almost idle to refer to the instances of persons who, in the various plague epidemics which affected London, withdrew from that city to the country, and remained free from the distemper ; because it may be said that they were not susceptible, or had not been previously in communication with persons labouring under the disease. Yet it is a well established fact, that, though free communication was maintained at these periods between London and the neighbouring towns ; and, indeed, it was impracticable to isolate London, or put its inhabitants under quarantine segregation ; yet the disease was never imported into these towns, and if carried, it did not spread.

The reporter, in short, undertakes to prove, that if persons can escape from a pestiferous locality, they may certainly, by removing to one not infected, remain free from the disease. In 1835, when the epidemic sickliness visited Cairo, Gaetani Bey gave the advice to send some leagues from the city, and to cause encamp under tents, in a dry well-aired situation, 22,000 men, composing the garrison, leaving for the service of the city only 2000 invalids. Plague produced no effect among the 22,000 men thus removed, while it prevailed among the invalids as among the residue of the population.

Some time previously, Clot Bey had given a similar advice as to the fleet, which was in the harbour of Alexandria. Though this had been placed and kept in rigorous quarantine, it had plague patients as long as it remained in harbour exposed to epidemic influence. After it was removed from the focus of infection, no more cases appeared. In 1813, General Maitland, then governor of Malta, being unable, notwithstanding the adoption of the most rigorous measures to extinguish the plague, which was then prevailing at Valetta, determined to cause barracks to be erected without the town, and compelled the population to inhabit them. After this proceeding the plague completely ceased. In 1841, Dr Masserano, observing the 7th regiment of Egyptian infantry in garrison at Damietta to furnish a great number of plague patients, though it was confined to strict quarantine, ob-

tained an ordinance that this regiment should be sent to a healthy place where plague was not prevailing. From this time the regiment presented no more cases of plague.

In April 1841, when the 3d regiment of cavalry was in garrison at Neguillé, in Lower Egypt, they were suffering from plague as other inhabitants of the locality. At the commencement of May they received orders to proceed to Zagazig, a village situate in the Delta, near the right mouth of the Nile. The plague patients, amounting to twelve, of whom several were dangerously ill, were placed in boats; but, in consequence of the penury of the means of transport, it was impossible to isolate them from the other soldiers; and during the whole voyage they were in contact with the workmen of the regiment and the soldiers' wives, who encumbered the vessels. At this period, though the intensity of the disease was abating, several plague patients were severely ill, and the condition of four of these made M. Penay, the physician to the regiment, afraid, lest they should die during the passage. Fortunately this apprehension was not realized. As soon as the plague patients began to remove from the sickly locality, they underwent a marked improvement; and by the time they arrived at Zagazig, after a voyage of ten days, almost all were convalescent. Only one died during the voyage. Those who reached Zagazig completely recovered. They met there the favourable circumstances in which they were placed after their departure from Neguillé, that is, they found a region in which the epidemic constitution had not been developed.

He concludes with the following aphorism. When plague ravages violently in Africa, Asia, or Europe, it always shows itself with the principal characters of epidemic diseases.

The reporter next shows, from a comparative view of the characters of sporadic and epidemic plague, that the former differs from the latter not only by the small number of persons attacked, but also and especially by its not presenting the characters peculiar to epidemic diseases.

A question of considerable difficulty next occupies attention. Is plague propagated after the manner of epidemic diseases, that is, by the migration of certain atmospheric influences, and independently of the action which the plague patients may exercise?

This question is not only not free from difficulty, but it is stated in such terms, that many persons will be disposed to object to it at the very outset. What is the mode, it will be asked, in which epidemic diseases are propagated? Is this positively ascertained? Is it understood that the persons of those affected have no influence whatever in propagating the disease? Can it be imagined that when ten, fifteen, or twenty thousand persons are labouring under any acute disease of the nature of fever or plague, the exhalations from the persons of these patients are to

have no influence in diffusing and extending the disorder? Such will be the language held by many, we do not pretend to say, with how much or how little reason. Many who allow that yellow fever is not originally a contagious disease, and arises mostly from terrestrial emanations, acted on by particular atmospheric conditions, contend, nevertheless, that, as the disease advances and affects many persons congregated in one locality, and accumulated towards one or more points, it acquires contagious properties, and thus is extended and diffused in the ulterior course of its visitation. The correctness of this view we have always held doubtful; yet we believe that many respectable members of the profession conscientiously believe it to be well founded. As to plague, we are much at a loss what opinion to entertain. We have always thought that more was made of the supposed power of plague patients in diffusing the disease than the facts of the case could warrant. At present, the question must be regarded as open to inquiry, and for a considerable time to continue so. We have merely to observe that the reporter, evidently in his mode of stating the question above given, presumes that the persons of the sick, and the alleged emanations from them, have no concern in the propagation and diffusion of the disease. This presumption, however, is at variance, as we shall see, with the views of some of those observers even, who deny the existence and influence of contagion.

The reporter, in order to illustrate the question now stated, adduces the following facts and considerations.

Localities adjoining to that in which epidemic plague has sprung up, often remain free from any attack. Plague has often, for example, prevailed in Trebizond without appearing at Platana, a port with which the inhabitants of Trebizond have constant communication. In 1834, plague raged violently at Constantinople, while the Isle of Princes and Buyukdéré had not one single case of the disease, notwithstanding communication at all times. In 1835, when Cairo was a prey to a pestilential epidemic which carried off one-third of the inhabitants, the town of Abouzabel, which is only four leagues from the capital, and communicated freely with the latter, was for near two months exempt from the disease.

Sometimes, on the contrary, epidemic plague attacks successively and gradually the city and the neighbouring villages. Frequently it strikes towns remote from each other, avoiding intermediate points. Does epidemic plague, by aid of the atmosphere alone, cross seas and pass from one continent to another; for instance, passing the Mediterranean to go from Alexandria to Marseilles? Such is the opinion of Clot-Bey and M. Aubert-Roche.

Epidemic plague, however, may meet, not far from the place where it arises, insurmountable barriers; at least limits beyond which it does not extend. Thus plague rising in Lower Egypt

never passes the first cataract. Some places raised at a considerable height above the level of the sea, appear to enjoy complete immunity. At five leagues' distance from Constantinople is a village situate on the mountain of Alem-Daghe, at the elevation of about 500 metres = 1640 feet above the level of the sea. According to Dr Brayer, plague never appears there; and during the period of epidemics, this village is a place of refuge to the inhabitants of the capital. On the same mountain, but lower down, is another village, which is by no means exempt from visitations. In Malta, also, is one spot which, from this circumstance, has hitherto been inaccessible to plague. Lastly, Desgenettes and Clot-Bey ascertained that in plague epidemics which affected the city of Cairo, the citadel had always escaped any attack.

An important inquiry would be, to determine when a pestilential epidemic prevails in a town, how many patients owe their disease to the epidemic constitution, and how many are affected in consequence of absorption of miasms, or exhalations which have escaped from the persons of the sick, either by their direct or indirect contact. On this point M. Lacheze ascertained that at Alexandria and at Cairo, epidemic influence had struck persons completely segregated, so as to cause the death of one person among 400; while plague had destroyed one person among three among a population left in free pratique, that is, exposed at once to the influence of the epidemic constitution, and to that of miasms which might be extricated from the plague patients; in short, to contact direct or indirect with persons infected.

The reporter justly observes, that it is easy to see that the data here given are not much to be trusted to. Without calling in question the numerical statements of M. Lacheze, it is possible easily to give them a different explanation.

It is said that it is sufficient that persons who have performed quarantine, and those who are in free *pratique*, should be in opposite hygienic conditions, in order that the epidemic should attack them in very different proportions, and consequently, in order that the pestilential miasma, or the contact of plague patients, should not have performed the part ascribed to them. The reporter thinks it certain that persons who are placed in quarantine enjoy greatest ease, and take most care of their health. This point appears to us very doubtful, and can only be understood of those who withdraw altogether from the scene and locality of plague. Those who remain, and who are either placed or place themselves in quarantine, are subjected to so much restraint and confinement in most situations, that the remedy appears often worse than the disease. They may take as much care of their health as such a position allows; but it is certain that confinement, detention, and restrictions on personal liberty, are by no means favourable to the maintenance of health.

The reporter, however, to place the terms of comparison more on a footing of equality, tells us that they endeavoured to ascertain what was, whether at Alexandria or Cairo, the great establishment placed in quarantine, and containing a population in conditions as similar as possible to those in which the population left in free pratique were living. The Arsenal of Alexandria, which, during the epidemic of 1835, contained 6000 workmen at least, appeared in this respect to deserve consideration. In that establishment, no attack can be ascribed to an accumulation of pestilential miasms, because such accumulation did not exist, as, whenever a patient was recognized to be affected by plague, he was immediately conveyed to an hospital situate without the arsenal. It is equally impossible to allege as a cause the contact of pestiferous patients, considering that, either in consequence of the patient's being removed at the commencement of the attack, or from some other cause, those next to the individuals attacked by plague, and those who had touched the latter, were never attacked by the distemper. The number of the workmen of the arsenal conveyed to hospital on account of plague furnishes, therefore, the number of cases owing to epidemical influence alone, in the class least comfortable. 300 workmen having been attacked by plague among a total of about 6000 persons, it may be believed that the epidemic influence has affected 1 person in 20. This proportion differs, doubtless, from that given by M. Lacheze ; but it differs also considerably from that furnished by the population left in free pratique, which, at Cairo and Alexandria, lost, as already stated, 1 person in 3.

Are we to believe with Clot-Bey, that the difference in hygienic conditions explains completely these facts ; and that, if the workmen of the arsenal have not lost more than 1 person in 3, they owe it entirely to this circumstance, that they were kept in greater cleanliness and comfort, and better fed than the rest of the population of Cairo and Alexandria ? In admitting the great power of hygienic observances in preventing and moderating the ravages of plague, the reporter allows, that the inference deduced by Clot-Bey appears to go beyond the facts. On this point we shall probably speak afterwards.

The reporters further do not admit the final conclusion of Clot-Bey, namely, that to epidemic influence alone ought to be ascribed all the cases of plague. This conclusion they reject, on the one hand, because it appears not to be supported on positive or satisfactory proofs ; and, on the other hand, because, were it admitted slightly, it would have the great inconvenience of standing as an impediment to the study of the causes, which secondarily propagate the disease and augment its disasters. In scientific inquiries, they observe, a false explanation is less dangerous in this respect, that it diffuses error, than in the other of preventing us from searching for truth.

In conclusion, the reporters think the following proposition established.—

Plague, abstracting from the influence which may be exerted by plague patients, is propagated after the manner of epidemic diseases; that is, by the action of general causes.

Let us now see, before finally quitting this part of the subject, what information the evidence given by the physicians interrogated by the English government furnishes on this question.

In February 1889, the British government authorized their consuls at Constantinople, Smyrna, Aleppo, Alexandria, Prevesa, and Marseilles, to circulate among physicians settled in various places, connected with their respective consulates, the following seven queries:

1. Is plague communicated by contagion? 2. Is plague communicated by contagion alone, or by other means also; and if so, by what means? 3. Is actual contact with an infected person necessary for communicating plague, or will a close approach to such person communicate the disease? 4. Can substances which have been in contact with an infected person communicate the plague; and if so, what substances? 5. How long may the infection of plague remain dormant in an infected person before it declares itself by evident symptoms? 6. How long will the contagious matter of plague, when lodged in inanimate substances, retain its infecting power? 7. What are the means by which substances containing the contagion of plague may be purified?

Answers of different kinds were received from fifteen physicians. Seven gave answers decidedly in favour of plague being a contagious disease;—Dr Floquin of Smyrna, Dr McCarthy of Constantinople, Dr Raffinesque, Dr Icare, Dr Gaetani Bey, Dr Del Signore, and Dr Grassi, Proto-Medico of Health in Egypt, at Alexandria. One, Dr Pruner of Cairo, allowed that plague arises spontaneously in Egypt; that it may be either sporadic or epidemic; and that in the first case it is scarcely contagious, but that, when epidemic, it may probably become contagious nearly in the same degree, under the same conditions, and in the same manner as typhus, malignant dysentery, hospital gangrene, and similar diseases, which may be developed by miasms, and may be propagated by infection in confined situations, as in prisons, barracks, and hospitals.

Five physicians maintained that the disease was not propagated by contagion, but by endemic or epidemic influence; Clot-Bey, Dr Abbot, M. Seisson, Dr Fischer, and Dr Laidlaw; and other three, M. Perron, Dr Duvigneau, and Dr Robertson, speak rather doubtfully, and, excepting the last, with some confusion, yet more against than in favour of contagion; allowing that its existence is either not proved, or that the phenomena cannot be explained by its existence and influence.

Of these, Clot-Bey denies any thing like contagion ; contends that the disease is never communicated by this principle ; maintains that the disease is the offspring of the soil and atmosphere, and local causes generally ; that the atmosphere, however, is the principal, if not the sole, agent by which the disease is formed and developed, and admits that it is propagated only by epidemic influence. Dr Abbot thinks that actual contact is not necessary, though all close approaching is dangerous ; but he maintains the omnipotence of epidemic influence, and the inutility of quarantine restrictions. He thinks the disease is not communicated by goods or clothes.

M. Seisson speaks doubtfully of contagion. If the disease be contagious, he argues, it is not so in the manner of diseases reputed and generally known to be contagious. The influence of contagion is in short not proved. On the contrary, the disease is certainly communicated otherwise than by contagion. It springs up spontaneously in countries where it is endemic, as in Egypt and Turkey ; and when epidemic influence is once manifested, segregation and quarantine restrictions are utterly useless. He thinks it not impossible that in extraordinary circumstances, and independent of importation, epidemic influence may be manifested spontaneously in countries where the disease is not endemic, yet which have some analogy in climate and geological characters with those regions in which it is. The contact of an infected person is not indispensable to the communication of the disease, but it adds to the danger of epidemic influence that of the infecting influence of patients under the disorder.

M. Perron speaks much in the same manner. After perplexing himself about contagion, he at once maintains that the existence of contagion, as usually understood, that is a virus transmissible to distances more or less remote, either by individuals or by articles, is to him any thing but proved ; in short it is not proved. He admits that persons remaining in a place where plague is prevailing may contract and do thus contract the disease ;—in short he allows the existence and operation of a locally tainted atmosphere. He allows also that if patients are too much approximated to each other, their persons may infect the atmosphere. He recognizes the existence of epidemic influence. Plague is an endemic disease, and requires for its production the climate and soil of Egypt, and the accessory habits of its inhabitants ; and it is quite impossible, physically impossible, he thinks, to export plague to countries in which neither the climate nor the soil of Egypt are found. The epidemic constitution of the atmosphere he also admits ; and as it is impossible to say that this may not extend over different parts of the globe, or may be developed in some parts or other, he does not deny altogether the utility of quarantine restrictions, but he maintains that they might be and must

be, in order to be useful and not hurtful, very different from those at present in use. He thinks, however, that, in spite of every precaution, there may be established in Europe, and over the whole extent of the globe, general circumstances in which plague may find what is favourable to its formation and diffusion, and, in that case, no means in the world will prevent this distemper from travelling in various directions, and committing the usual ravages in different countries.

Dr Duvigneau gives a similar opinion, though encumbered with various contradictions. He thinks that to contagion too much influence is ascribed. In certain epidemics, as in the plague of 1839 at Cairo, the first cases looked like the effect of contagion ; but such coincident accidents are observed in all epidemics. Sometimes one side of a street, one district alone is attacked. Plague takes place at Cairo and none at Boulay ; villages continue in a state of perfect health amidst villages suffering under the distemper. Plague is not always contagious. Sporadic plague is certainly not. Of this fact Lower Egypt presents annual examples. Some persons only are attacked ; and the disease arises spontaneously. When the disease is contagious, so far as it may be so, the co-existence of certain peculiar circumstances, a certain disposition of the individual, perhaps a change in the magnetic state of the ground are requisite. When this state ceases to exist the contagious power is extinct. During, and at the close of the plague, the effects of the dead, their mattresses, coverings, linen, and all are put in use, often without the previous precaution of any measure of salubrity, or even of cleanliness. Meanwhile the ravages of the distemper cease ; the distemper itself completely disappears ; because the general influence having ceased, the contagious matter has lost its action.

The following anecdote is given by Perron and Duvigneau, and is repeatedly quoted by others, in order to show the small power of contagion. We know not whether its indications be so strong as the authors imagine. But it may be received for what it is worth.

There was established at Abouzabel, four leagues from Cairo, a sort of quarantine for the hospital. Tents were placed in the desert at a short distance, for keeping the patients under observation for several days, before they were made to enter the hospital. The majority of patients were furnished by the hospital at Cairo, which was crowded with sick and plague patients. Their number was very soon too great for the space assigned to receive them ; and they could often remain only three days, two days, and even twenty-four hours under observation. Five physicians, of which Dr Duvigneau was one, were attached to the service of the hospital. They performed daily two or three visits to the plague patients, whose tents were removed only two hundred paces from the first. Forty inspections were made at periods shortly after



death. Three bodies were inspected 15, 20, and 25 minutes after death. The physicians never adopted any other precautions except that of washing the hands with water and vinegar, then with water and soap, when the former was wanting. They never changed their dress before entering the hospital, where they made daily two visits, approaching and touching the patients as usual. Notwithstanding all these means for facilitating propagation, not one of the physicians experienced the slightest accident; not a single patient of the hospital was attacked with plague; and yet the number of those treated during the months of April, May, and June was considerable, as it amounted to one thousand persons.

By the advocates for contagious influence, it would be said, first, that one negative fact proves nothing amidst several or many positive facts; and secondly, that the persons so exposed might not be susceptible. It cannot be denied, nevertheless, that where none were attacked under circumstances apparently of considerable exposure, the disease cannot be very contagious.

Dr Duvigneau allows, however, that the persons of plague patients may furnish exhalations, which, under the action of a peculiar inexplicable influence, may communicate plague, directly by contact with the patient, indirectly by contact with articles which have been used by them, and impregnated with their exhalations.

The most extraordinary testimony perhaps is that given by Dr Fischer, Professor of Anatomy at the School of Medicine at Abouzabel.

He first perplexes himself a little about the nature of contagion, which he states to be of three sorts. 1st, Contagion properly so called, which produces itself by immediate contact either of person or of articles impregnated by contagious matter, as in itch. 2d, Contagion by inoculation, in which a poisonous material is introduced into the human body, and taken into the blood-vessels, as in rabies. And 3d, Contagion by infection, when the noxious elements are received by absorption in the mucous membrane of the respiratory organs, or of the intestinal tube.

He is not in possession of facts to prove that glandular plague is propagated by contagion properly so called; and, notwithstanding various facts which seem to prove this mode of propagation, he is of opinion that glandular plague is not contagious, but propagates itself only by infection under the influence of particular causes.

This opinion he rests on the facts, that cases of glandular plague are observed every year in Egypt; that those affected sporadically present all the usual symptoms of the disease, as during the prevalence of an epidemic; that these persons die speedily; that they are seen and touched by many persons without the disease

being diffused : and their beds and other articles are used by other persons without thus extending the disease ; that various villages remain exempt while others are attacked, for instance the exemption of Abouzabel already mentioned ; while, on the other hand, during epidemic visitations, persons are attacked and cut off, notwithstanding the strictest isolation and the most rigorous quarantine.

Dr Laidlaw of Alexandria is of opinion that plague is endemic in Egypt, and in the Turkish dominions. He has seen sporadic cases repeatedly arise, and destroy the individuals without any other person being attacked in consequence ; and he is sure, from multiplied instances, that the disease is never so communicated. As to the infectious nature of the disease, by which he understands the property of spreading itself from man to man, though he feels that he is not warranted in saying, that the disease is in no circumstances communicated from individuals ; yet he sees in this no ground for the inference, that it is the cause of the disease spreading epidemically. He observes, however, that whenever any number of plague patients are assembled together, they seem to create an infectious atmosphere, if ventilation be not particularly attended to ; for in general, when many plague patients are collected in one point, all the attendants are attacked. Plague depends in a great degree, though not wholly, on the season of the year. It is not epidemic annually. Its epidemic visitations evidently depend on certain, probably peculiar atmospheric conditions, which occur only at certain intervals, and without the occurrence of which the disease cannot exist or spread. Yet though thus endemic and perhaps tempestival in origin, there may be circumstances under which it may be developed, notwithstanding every precaution adopted.

Dr Gaetani Bey, first physician to the viceroy of Egypt, is decidedly of opinion that the disease is propagated by contagion. But in so saying, he does not wish it to be understood that the distemper may not be generated by epidemic causes and by infection, and so propagated, that is, by atmospheric influence and agency alone, without contact. Allowing that the disease arises spontaneously in the Levant, and that sporadic cases occur annually in Lower Egypt in certain seasons without spreading, he thinks that cases of this class must be independent of contagion entirely. Immediate contact is not necessary. But when many persons affected by plague are crowded together, their presence may contaminate the atmosphere, and create an epidemic constitution or influence, which shall affect all that enter the limits of that atmosphere. This Dr Gaetani Bey calls mediate contact. Persons affected with plague in various epidemics have fled from Lower Egypt to Upper Egypt, and there have died. Yet in no instance has it been found that the disease appeared in Upper Egypt. The soil

and climate are unsuitable. In Lower Egypt also, many populous villages not subjected to any quarantine restrictions, even of the slightest nature, though surrounded by infected places laid waste by the epidemic, were never attacked by the distemper. If it be asked, what conclusion is to be drawn from these well ascertained and remarkable facts, Dr Gaetani Bey thinks that it must be, that plague did not penetrate to Upper Egypt, and enter these villages, solely because epidemic causes were wanting and did not operate.

He finally concludes ; 1st, that epidemic causes, though, under some circumstances, they may of themselves produce the disease, yet generally do no more than predispose the human frame to its attacks ; and, indeed, plague, he thinks, has rarely been known to arise from these causes acting alone, while it has very frequently been observed where they have acted conjointly with the latter. 2d, That the two kinds of contact, though insufficient to produce the disease, where the general pathogenic causes do not exist, are yet capable of determining its developement, wherever the presence of these causes has predisposed the individual to the attack.

Dr Del Signore has no doubt, that plague is communicated by contagion, and he knows no other mode of communication. Contact with the infected person is necessary for the communication of plague, and simple proximity is not sufficient. Consequently, a medical attendant runs no risk of contracting the disease, if he visits a body of infected individuals, investigates their pathological condition, and examines the condition of every symptom, so long as he avoids only touch.

Dr J. Robertson, Deputy-Inspector-General of Hospitals, had occasion to observe plague at Jaffa in February 1841, shortly after at Beyrout, where it prevailed from the 27th February to the 23d June 1841, and, as we stated in last article, it was prevailing at the same time at Acre and Sidon, in short, over much of the coast of Syria. Dr Robertson paid much attention to the mode in which the disease appeared and arose in the former places ; and as to the two latter he had accurate information. On the 4th of May 1841, he inspected all the houses at Beyrout known to be infected ; and as these towns are not large, the means of information may be allowed to be more applicable to the purposes of the etiological inquirer. The following are the conclusions at which he arrives. Two of his facts, 10 and 11, are premised.

“ 10. A friend, on whose report I have every confidence, informed me, that when he was a passenger on board an Austrian steamer, going from Beyrout to Smyrna, a person was seized with plague, the nature of the disease was not immediately discovered, and the patient remained in communication with the other passengers for several days. The vessel was placed in quarantine at Smyrna ; none of the passengers took the disease. The plague patient was landed, and I think recovered.

"11. An Austrian officer, a man of rank, died of plague at Damascus; his friend who nursed him, and frequently supported him in his arms, felt no bad consequences.

"After an attentive and unprejudiced consideration of the foregoing facts, I think it impossible to maintain that plague is a highly contagious or infectious disease, and that the slightest actual contact (most Levantines exclude all other mode of infection) with a diseased person, or contaminated substance, is sufficient to produce the disease. I am aware that the advocates of contagion assert, and most truly, that some individuals, from peculiarity of constitution, are not susceptible of infection; and this might be a satisfactory answer to a solitary case of exemption, such as the last quoted, but where, as in the other instances I have adduced, a large number of persons were exposed with impunity, to contact with the diseased, the explanation is not satisfactory."

"In reference to the circumstances I have stated as seeming to support the doctrines of contagion, and that the disease was possibly imported from Acre or Egypt, I have to observe that, all the individuals arriving from these places by sea, were placed in the lazaretto to undergo quarantine; those coming by land at first entered the town, but in all cases where the disease was developed, the patients were sent to the lazaretto, as also all who had communicated with them; and in no instance could I trace that there had been communication betwixt these strangers and the inhabitants of Beyrout, who were afterwards attacked; and I have given an instance of six persons having been shut up in the lazaretto with a plague patient from Acre, without injury.

"That the Turkish soldiers were first attacked is not surprising; they were lodged in miserable damp khans, and much crowded."  
—P. 562, 563.

Quarantines and their restrictions are unavailing.

"As a proof that the contact with a diseased person or contaminated substance is the sole cause of the complaint, the immunity which persons enjoy who isolate themselves during the prevalence of plague, is constantly adduced. This immunity has, I believe, been much exaggerated: some few instances came under my own observation, where isolation did not prevent an attack. At Caiffa, near Acre, a whole family except one was cut off while observing strict quarantine. The one who escaped probably owed his safety to the circumstance of his having taken flight to a more healthy locality."

"It often happens, however, that all these precautions are vain; the disease penetrates into the best guarded retreat. In such cases the absurd and ridiculous stories which are told, to account for the disease consistent with their preconceived opinion of contagion, by contact only, at once serves to prove how rigid and perfect had been the isolation, and how useless it had proved as a means of security. No stranger has entered; the food of the family, and every other article introduced, has undergone the prescribed form of purifica-

tion ; in that case, a stray dog or cat, a bird or insect, is accused as the infecting medium, or some contaminated piece of cotton or paper has been blown in at some unprotected aperture. It would appear, therefore, from what I have stated, that numerous persons who have been in intimate communication with the diseased, escape ; and that frequently those who most carefully seclude themselves fall victims, whose attack can only be accounted for by the contagionists on the most improbable grounds.

“ Upon a review of all the circumstances, the only conclusion I can arrive at is, that plague arises from local causes, although the nature of these, and the peculiar circumstances under which they are generated, are, and probably will for ever remain unknown. The endemic nature of the disease in Syria is proved by the fact, that it is often developed in the interior of the country, in remote mountain villages, distant from the great route of communication with those countries where plague is known to exist. It existed at Zeb-d-Eni, in Anti-Lebanon, during the last summer,—a season when it is never known on the sea coast.

“ An intelligent French surgeon, who was in the Egyptian service, stated that for two years preceding 1841, plague had existed in some of the mountain villages of Lebanon. The disease produced great mortality at Acre, Caiffa, Tyre, and Sidon ; at the latter place 1800 are said to have perished out of a population of 9000 ; 400 cases occurred among the troops, and 190 proved fatal. Contrast this result with what occurred at Beyrout, when the total number of cases was 121, notwithstanding there were abundant opportunities for the disease to propagate itself by contagion. Further north than Beyrout, the disease was even more rare ; at Tripoli it did not appear at all ; and Aleppo, according to information I received in my inquiries there, had not been visited by plague for thirteen years ; yet all these places were not protected by any sanitary regulations whatever, nor indeed could any ever be established that would be efficient in a country like Syria, to cut off communication between diseased and healthy places. The fact seems to be, that the causes of plague, whatever may be their nature, are sometimes confined to certain localities of a country, sparingly generated and acting with little intensity, only affecting a few and probably highly predisposed persons ; at other times the deleterious influence is widely developed, and acts with extreme energy, producing an epidemic, with frightful mortality. Want of cleanliness, heat and moisture, the decomposition of animal and vegetable matter, have been assigned as causes of plague ; but all these, if they have any influence, it is only of a secondary nature ; and some peculiar circumstances, as yet beyond the reach of science, are necessary to its development. Some of the above causes do not seem to have much influence even on the progress of the disease.

“ Beyrout is one of the most filthy towns in Syria ; the sewers are uncovered and most offensive ; the immediate vicinity is covered with the putrid bodies of animals, and I refer to the sketch, by

which it will be seen that at no great distance there is a low irrigated ground, highly productive of miasma. In the neighbourhood of this ground I admit the attacks were most numerous, the scanty population considered.

"Temperature certainly has great influence on the disease, which never, or scarcely ever, appears until after the great heat of summer is over, and disappears in June when the hot weather returns. Hot days and cold nights seem peculiarly favourable to its production.

"In conclusion, in reference to the contagious or non-contagious nature of this at times frightful disease, I beg to state, that the result of all my experience leads me to believe, that the disease originates in local causes, and that it is endemic in Syria and Egypt; that it is not of a highly contagious nature; and that if ever so at all, some other concurrent circumstances are necessary to render it so. Extreme and exclusive opinions on the doctrine of contagion, are hardly warranted by the present state of our knowledge; my own firm conviction is, that the plague cannot be communicated from one person to another in a pure atmosphere, even by contact, but I am not prepared to assert that if plague patients are crowded together in confined and ill-ventilated apartments, infection will not be produced, just as happens in typhus fever."—Pp. 564, 565.

If there be accuracy in human observation, if there be faith in human testimony, if there be truth in human evidence,—we know not what to make of these statements, unless to admit the following inferences: 1st, that plague is manifestly an endemic disease depending on local causes; 2d, that in certain seasons, and in certain seasons only, there is an epidemic or peculiar state of the atmosphere, which tends to cause the distemper to be diffused and propagated among great numbers of people placed in the same circumstances, breathing the same air, living in the same districts, and observing the same habits; 3d, that this is not contagion, properly so called, in so far as common or general causes affect many persons at the same time, and one person is not affected from another; and, 4th, that in this state of matters quarantine regulations, with all their rules about segregation, isolation, seclusion and expurgation, are not only useless and inert, in not preventing the propagation and diffusion of the disease; but they are positively injurious in accumulating upon certain points, with contaminated or contaminable atmospheres, many persons, who, if dispersed over a wider space, might not only escape the disease themselves, but might not communicate it to others.

If the doctrine now stated be correct and well founded, it is clear that nothing short of removal from the locality or district can prevent the disease from continuing its attacks. Ventilation, as tending to purify the air and correct the morbid qualities of the soil, is all very good; but it must be very inefficient, after the sur-

face of the ground and the atmosphere together, have arrived at that state, whatever it may be, which may be called plague-point. When this is the case, no measure but the removal of materials, the ejection and expulsion of the human beings from the region, can be of the smallest benefit.

In the third part of their Report, the reporters enter on the question of the communicability of plague either by means of epidemic *foci*, or without these adjuncts.

And they first consider the question of the communicability of plague by inoculation by blood drawn from the vein of a plague-patient, purulent matter taken from a bubo, or serum extracted from the phlyctaena of a pestilential carbuncle.

Of all such experiments, which appear to us both disgusting and not conclusive, it is sufficient to say that not one has furnished any useful information whatever. It is to be observed that these experiments are inconclusive, because, being performed in situations and at seasons when plague is or was prevailing, the disease, when it does take place, might have been owing, not to the inoculation, but general causes, as infection or epidemic influence. At the very first we meet with a story which shows the lameness of the cause which is to be supported by such means, and the gross credulity or blind folly of those who believe such stories. It is pretended that Willis inoculated himself with plague in 1665; and died of the disease. This story the reporters call in question. They may justly do so. Willis died at the age of 55, not in 1665, as this story implies, but on the 11th day of November 1675, not of plague, but of *bronchitis*, terminating in pneumonia and pleurisy. That was further not a plague year.\* But had it been so, Thomas Willis was, amidst an age distinguished by men of piety and integrity, too pious and sensible a man to perform so reckless and useless an experiment. The nonsense about White, Valli, and others, we therefore pass over entirely. The only facts deserving attention are given by the reporters as experiments performed in 1835 at the Hospital Esbequié at Cairo, in presence of Dr Gaetani Bey, Clot-Bey, Dr Lacheze, and M. Bulard. These are the following.

On the 15th April 1835 five persons condemned to death were, at the request of Clot-Bey, taken from the citadel of Cairo and brought to the Hospital of Esbequié, where they were to be the subject of experiments, intended to elucidate the question, if plague be communicable by inoculation or not.

On the 18th of April, M. Lacheze took a lancet dipped in the blood flowing from the arm of a plague patient, and introduced

\* *Athenæ Oxonienses*. By Anthony A. Wood, M. A. of Merton College. A new edition, with additions and a continuation, by Philip Bliss, Fellow of St John's College. Vol. iii. p. 1048. Lond. 1817.

this lancet under the epidermis at two points of the inner surface of the arm of one of the condemned persons.

On the 21st April, this convict had plague, which M. Lacheze calls confirmed, and which M. Clot-Bey regarded as doubtful. On the 26th April, the patient was convalescent.

On the 22d April, M. Lacheze performed another inoculation by means of pestiferous blood. It produced no result.

On the 30th of April, the same attempt was made on another subject, and was equally ineffectual.

Lastly, a young man, aged 18, who had mild plague, after having slept on the 15th April previously on the clothes of a bed recently left by a plague patient severely attacked, was inoculated with the blood of a plague patient on the 13th of May. This inoculation was equally without result.

The same person had undergone, eight days previously, and with the same immunity, an inoculation in the groin and in the arm-pit, with the serum taken from the vesicle of a carbuncle.

Another condemned person, aged 16 years, was inoculated on the 20th April with serum taken from a carbuncle. The result was negative.

On the 30th of April, the same person was inoculated in the arm-pit and in the groin of the right side with the matter of a bubo, which had just been opened. This inoculation was without effect.

From these experiments it follows, that among four persons inoculated with the blood of a plague patient, one only had an attack of mild plague; while two persons inoculated with serum taken from a pestilential carbuncle, and a third inoculated with the matter of a bubo recently opened, experienced no symptom of disease.

The reporters add, that if it be remarked, that the individual who had mild plague in consequence of inoculation by blood, was then, as all the inhabitants of Cairo, under the epidemic influence; that, further, he was for three days in an hospital which contained many plague patients under treatment, and which hospital had become the source of pestilential infection, it will easily be allowed, that doubts may be entertained on the real cause of the disease.

At a later period, Clot-Bey inoculated himself with the blood of a plague patient. By a lancet dipped in this blood, he made six punctures sufficiently deep, three of which were at the anterior part of the left fore-arm, and three at the fold of the right groin. No symptom of plague followed.

Some days after this ineffectual inoculation, Clot-Bey inoculated himself with matter from a pestilential bubo, by three punctures made on the internal surface of the left arm. This trial was followed by slight feelings of uneasiness, which the experimentalist ascribed to absorption of purulent matter, and which presented no analogy with the symptoms of plague.



Lastly, M. Pruner, in a letter addressed in 1829 to the consul-general of England, residing at Alexandria, asserts that the blood of plague patients and the matter of buboes have produced, by their inoculation, nothing like plague.

The only inferences which can be justly drawn from experiments of the kind now mentioned are, that they furnish at best doubtful results; and if we adhere strictly to their interpretation, they would show that plague is a disease not communicable by inoculation, either by pestilential blood or the matter of buboes.

The next question which demands attention is, whether plague is communicable by contact of patients, that is, by immediate or direct contact.

This is the mode which has been believed by the whole body of contagionists, wherever the doctrine of contagion has been taught, to be least objectionable, most perfectly established, and that by which plague was most usually and frequently propagated. It is needless to trace the history of the origin of this doctrine from Fracastorius downwards, which has been already often done in this Journal. It is enough to say, that, though from time to time, in the course of nearly three centuries, individuals appeared, who thought for themselves, yet, on the whole, it was the accredited doctrine in all the medical schools of Europe; and any one who ventured to express a doubt of its truth, or to differ in opinion, was regarded as an eccentric unreasonable person, with whom it was idle and dangerous to hold any communication.

Matters were in this state when, in 1835, a considerable number of European physicians had occasion to observe the extensive epidemic which prevailed over Egypt. The result of this was, that their previous opinions were very much shaken; and while M. Brayer and Cholet, who had observed plague at Constantinople in 1819, 1826, and 1834, changed their opinions as to the contagious character of the distemper;—MM. Aubert-Roche, Clot-Bey, and others, either took the view that the distemper was not contagious at all, or very much modified their opinions as to this property. The facts which have contributed to effect this revolution are various and multiplied. A few only can be noticed. Several have been already stated.

In the plague of 1824, at Cairo, 30,000 individuals were destroyed. In Alexandria, only two or three cases took place, and the disease never spread, although the communications were positively unrestricted. Sometimes plague has raged in the suburb of Boulac, and yet has not entered Cairo, though no precaution has been adopted.

Two harbours situate on the Red Sea, Suez and Cosseir, derive all their supplies of food from two towns in the interior. Suez receives its subsistence from Cairo, and Cosseir from Keneh, a town of Upper Egypt. In 1835, plague broke out at Keneh

almost at the same time as at Cairo. Suez was attacked by the disease; while Cosseir, left in free communication with Keneh, had not one single attack. The temperature of Suez is lower than that of Cosseir, which, surrounded with dry naked mountains, is founded on rocks; while, on the contrary, Suez is surrounded by stagnant waters and marshes of salt water, circumstances which give it the atmospheric and physical condition of the towns of the Delta.

During the epidemic of 1835, Djedda, Yambo, and Moka enjoyed the same immunity as Cosseir, though plague patients, proceeding from Suez or other infected places, died in the middle of the inhabitants of these towns.

It has been observed that while Syria and its towns are ravaged from time to time by plague, yet Arabia, with which there is the freest communication, has never been affected. Nubia, Sennaar, and Abyssinia have also remained exempt, notwithstanding their free and uninterrupted relations with Egypt. Now, if in regard to Arabia, Sennaar, and Nubia, it may be said that the high temperature prevents the condensation of pestilential miasmata, the same reason cannot be applied to Abyssinia, a temperate country, and where the thermometer varies from 15° to 25 centigrade above zero. Here the salubrity of the country can alone repel the disease. Abyssinia is a country of mountains and elevated table-lands arranged like a series of inclined planes, where are neither marshes nor stagnant waters.

One of the least equivocal characters of the non-contagion of a disease, however, is the fact that either attacks take place independently of each other; that is, when two or more persons are attacked, there is no evident communication between them; or if this take place about the same time, all are attacked within so short a time of each other, that it is impossible to believe that the distemper could be transmitted from one to the other, and that it is not less impossible to doubt that all have become ill from one general and common cause. Of these characters the following are examples.

Three soldiers of the 5th regiment were attacked by confirmed plague. They belonged to three different companies. As they were left in free communication with their comrades till the time when the nature of the disease was established, the whole regiment nearly was found in the state called compromised, that is to say, suspected, yet no other case took place among the corps.

At the same time, M. Penay, physician to the 5th regiment of cavalry in garrison at Neguillé, in Lower Egypt, ascertained that among 40 plague patients only 2 came from the same tent; all the others had been attacked in different tents.

Though the hospital at Neguillé received many patients, yet none of the persons who were in frequent contact with the patients,

such as the nurses or servants of the hospital, the apothecary, the physician, experienced the smallest symptom of plague.

At the commencement of the epidemic of 1841, the Plague Hospital at Cairo was not yet established, and plague patients were received into the Military Hospital and treated along with those attacked by other disorders. The latter class of patients did not contract plague. One hundred and eighty-two plague patients were treated in the hospital. The numerous staff of attendants of all ranks attached to the establishment presented no attack. The ordinary patients and the attendants in this hospital, nevertheless, amounted to 1200 persons.

Among the body of officers of health, consisting of 92 Europeans and 300 Arabs, no one performed quarantine. All zealously attended plague patients without observing any precaution. Among the European officers of health, three cases of plague took place, of which two recovered. Among the Arabs, three cases also took place, but all died.

M. Chedufau, the chief physician to the Military Hospital at Cairo, attended in the city 61 persons ill of plague, in whom he opened buboes, dressed carbuncles, and to whom he devoted every sort of attention. He performed 17 morbid inspections. During the whole epidemic he never ceased to be in communication with his family, and without employing any preservative; yet neither he nor any of his family presented any symptom of the disease.

The general conclusion at which the reporters arrive from these and similar facts is, that attentive and rigorous examination of facts shows, on the one hand, that the immediate contact of thousands of plague patients is free from danger to those who practise this contact in open air, or in well ventilated situations; and, on the other hand, that no correct observation proves the communicability of plague by the mere contact of patients.

It has been very uniformly and confidently maintained by European physicians of all countries, that plague is transmissible in articles of clothing and such materials as have been near or in contact with the persons of plague patients; that articles of this kind might imbibe or be impregnated with the peculiar pestilential virus; that this they might retain for years, and then, by giving it out when opened or used, engender plague, and propagate the disease in situations where it was either unknown or had not for a long time appeared. Such articles have been denominated *fomites* of contagion by all the teachers in the European schools; and against the introduction of plague, by means of these *fomites*, many, if not most of the restrictions, rules, observances, and expensive and sometimes destructive processes of the quarantine laws were directed. As some articles were conceived highly capable of being impregnated with this material cause of plague, and

others less so or not at all, this led to the distinction of articles into susceptible, highly susceptible, little susceptible, and insusceptible; and it is utterly impossible for the most fertile imagination to conceive any thing more wild, more irregular, or more unreasonable than the division of articles into these different classes and orders, and the variety of rules and modes of disinfection thereby suggested. To speak of principle, or seek for some system, is quite idle and foolish; for no principle can be found. All is arbitrary confusion, unreasonable and futile distinction, and only shows what extravagances human reason may perpetrate when under no guidance but that of fear, ignorance, and the most gross and confident presumption.

Of all this doctrine of transmissibility by articles of clothing and similar substances, no trace existed in the Levant till within the last twenty-five or thirty years, when learned Europeans began to settle among the Moslemin, and teach them the arts and sciences of Franguestan. When plague appeared in a town or city, many retired out of the way; many remained and attended the sick till the disease terminated in death or recovery; new cases continued to occur; but the Moslemin always looked forward, with confidence to the time, when the disease was to stop, as it had been previously known to do, at the stated period. This period arrived; the distemper did stop; and health was once more restored to the air of the ravaged city. All the bedding and clothing of the dead were sold in the bazaars, and no evil results followed; the survivors returned into society with their clothes as formerly, cleansed, of course, if they could afford the expense; and, if they could not, to be ventilated by the fresh air.

It does not appear that under this system of no precaution, the disease visited the Moslemin one day sooner, or lingered one day longer, or destroyed any more victims, than it has done under the quarantine restrictions of the enlightened Franks. Some persons even assert that it has been rather more severe since Frankish customs came into use than previously. At all events, it could not be worse than it has been since that time. Certainly the blind fatalism of the Moslemin did not produce more evils than the foolish and absurd observances of the Ghiaours.

Let us hear what Mr Thurburn says, an enlightened English resident, who has repeatedly observed the disease, and its mode of diffusion in Egypt.

“ Before concluding these observations, I must express my most decided opposition to all attempts at suppressing the plague, should it again appear here, by shutting up the houses where the disease has manifested itself. The horrors which attended the unsuccessful introduction of that practice during the epidemic of 1834 and 1835, when the Arabs were driven to bury their dead in their houses, or to throw them into the streets, in order to avoid the quarantine re-

strictions, have convinced me not only of the barbarity, but of the absolute folly of such measures. I was myself a Member of the Board of Health at that time, and it has been a consolation to me to reflect that I had contributed to induce the government to discontinue that practice for the time.

"I am aware that the cessation of the plague at Malta, in 1813, and latterly at Odessa, is ascribed by some individuals to the employment of similar means. In both cases, however, the disease ran its course for several months, and when it finally ceased, there is good ground for believing that its suppression was effected, not so much by isolation, as by some change in the atmosphere, proceeding, as in Egypt, from natural causes, or by the enforcement of greater attention to the means of diminishing its pestilential condition, and by supplying the poorer classes with nourishing food."—P. 510, 511.

Observe next what is stated on the same subject by the Cairo Board of Health, including several physicians expressly appointed to give a judgment on the merits of quarantine restrictions.

*"Reforms of which the Quarantine Laws are susceptible.*—Quarantines being established for the sole object of preventing the plague from the penetrating into Egypt, the Commission is of opinion, that if the plague is endemic in this country, they are of no use, since, even admitting the supposed importation of the disease, there would be required for its development the concurrence of the general influences of which we have before spoken, and which of themselves would be sufficient for its development without importation, for there are always in the country more elements of production that could be brought from abroad, viz. contaminated effects, and cases of plague. The inutility is still farther confirmed with respect to the importation from Syria, since it appears to be proved by the experience of every age, that the plague has never been introduced into Egypt from Syria.

*"Seclusion or shutting up of the Houses.*—The Commission declares that the measures of seclusion are not only useless, but pernicious and inhuman, inasmuch as they spread terror among those who are exposed to them, and cause the people to evade them by violating all the laws of medical police. It is, moreover, sufficiently proved, that seclusion has never stopped the progress of an epidemic. Seclusion is one of the causes that promote the development of typhus, as it has the effect of keeping the individuals thus shut up exposed to the effects of a vitiated atmosphere. The case of Giglio, so often brought forward in support of contagion, has clearly manifested the fatal consequence of seclusion, since, among the numerous individuals who were in communication with the first one attacked, only those who were shut in the house fell victims to the disease, whilst two of his brothers, who had made their escape in order to evade seclusion, did not experience the least sickness."—P. 512.

Then follows the recommendation.

"The Commission being persuaded of the good intentions of the

consuls; is induced to hope for, if not the total abolition of quarantine in Egypt, at least the suppression of the more rigorous sanitary restrictions, and that we shall no longer see vessels, coming from ports where no plague exists, subjected to quarantine at Alexandria during the prevalence of an epidemic there."—P. 512.

If these statements do not demonstrate most unequivocally, not only the inutility, but the pernicious effects of quarantine restrictions, we despair of the intellectual faculties of those who have the authority, ever becoming enlightened or amenable to reason.

This doctrine of contagion by *fomites* is giving way with that of personal contagion, before observation and actual experience. Among the physicians to whom the interrogations of the English government were circulated, the greater number doubt entirely, or call in question, this mode of communication; and among those who admit it in certain articles, more than one allows that the distinctions of susceptible and unsusceptible articles are founded neither on reason nor on experience.

Dr Floquin tells us that articles of clothing—woollen, cotton, silk, fur, and paper and leather, are all conductors of plague contagion; and that hair, wood, metal, glass, are non-conductors. How can fur be a conductor, it may be asked, and hair a non-conductor?

Dr M'Carthy agrees with the quarantine authorities in considering wool, cotton, fur, silk, and all articles manufactured from them; also, leather, paper, and metals with a rough surface, and money or currency, as conductors and susceptible.

Dr Grassi regards all substances capable of receiving infection, but not of retaining it. Metals he allows capable of receiving, but not in all cases of retaining it. He admits that it is not possible to assign any reason, why wool, cotton, and skins are more fitted to receive and transmit contagion than wood and metals. He finds horse-hair not on the list of conductors or susceptible; and also amadou, which last is highly susceptible.

Dr Clot-Bey allows, that the opinion most generally received affirms, that plague may be communicated by articles which have been in contact with the persons of plague patients. He sees, however, no reason to believe that this opinion rests on well established facts. He does not absolutely deny that articles which have been long in contact with the persons of plague patients may be impregnated by miasms or some similar subtle substances issuing from these persons; but he repeats, that this does not rest on anything like demonstration by incontestable facts. The fashion of ascribing the communication of the disease to these and similar articles, he thinks, has arisen from indifference to inquire after the truth. It is easy and simple to ascribe any given attack of plague to contact real or supposed of articles suspected to be im-

bued with pestilential matter, with those who think it difficult to comprehend how plague can arise from atmospherical causes.

Numerous facts prove, on the other hand, that the closest contact with suspected or used articles is not followed by plague in those who afterwards use them. The director of the hospital at Cairo neglected to cause to be washed the bedding articles, coverings, mattresses, and pillows, which had been used by hundreds of plague patients; and gave them these without previous purification, to be used by ordinary patients. Not one contracted plague. During the epidemic of 1835, more than 500 houses whose inhabitants had died were shut up. The furniture, beds, sofas, were left in these abodes, exactly as they had been when the dead bodies were removed. Towards the end of June and beginning of July, all these houses were opened; the effects were sold, and dispersed through the city and beyond it, without having undergone any sort of disinfection. Not one of the persons who first entered these houses, or who used these articles, were attacked by plague.

Dr Abbot has never known the malady to be thus communicated.

"In the Egyptian navy in 1835, quantities of effects of every kind, such as sheets, blankets, red night-caps, shoes, &c., were received on board the vessels of war, two or three days before their departure for Candia, from the stores of the arsenal, where the plague was raging. These articles certainly could not have been transported from the magazines without being touched by some infected person. In fact, I know positively that many persons ill with the plague were concealed in those same store-rooms, that they might not be seen by the quarantine medical officers. The day before our departure, the wives and families of the sailors were permitted to come on board the ships, to take leave; and many of the sailors of the ship I was in were then on rafts, busy in caulking the sides, and in other work. They not only received several articles from the hands of their relatives, but I myself, and several other officers, saw them embrace their wives and children. Many of the most susceptible objects were taken on board, and yet I am not aware that the least case of plague broke out in any ship after we sailed from Alexandria. Probably if a dress worn by a sick person should be immediately put on by one in health, while saturated with the perspiration and exhalations of the infected person, the disease might be communicated; but if the article were exposed for an hour to the sun and wind, I do not think it would communicate the disease to the wearer."—P. 471.

Dr Seisson thinks positively that inert bodies do not communicate plague. Egypt furnishes a remarkable fact which proves the negative, whatever may be stated on the affirmative side by many authors. The fact is this. Plague ceases at the end of June, at which time Cairo contains a multitude of articles of all

sorts, which have belonged to the victims of the epidemic; and a great part of the population are in fact clothed in the spoils of the dead; for as the Arab does not undress to go to bed, most of the patients have passed their whole disease and died in the same garments. In the hospitals, even the articles of plague patients are preserved without distinction between them and those of other patients. No one suffers from this indiscriminate and unpurified use of articles reputed suspected.

The classification of articles which ought to be founded on physical properties and chemical affinities seems unreasonable and frivolous, arbitrary and useless.

Dr Perron admits not one of the marvellous stories of alleged conveyance of contagion and disease by boxes, threads, bales, handkerchiefs, and other modes. All are equally incredible, and all equally silly.

Dr Duvigneau allows that articles that have been in contact with infected persons may communicate the disease, more especially articles of cotton or woollen, by imbibing and transporting miasmata.

Dr Fischer has not had experience to enable him to speak positively. But he is rather opposed to the belief of contagion by *fomites* on the usual grounds.

Dr Raffinesque believes that the disease may be communicated by means of the articles of clothing of plague patients. The substances most susceptible are linen, woollen, cotton, silk, and various tissues; woolly hair of the hare, deer, camel; and paper. Wood, metal, horse-hair, vegetables, fruits in general, and all substances smooth and polished are not susceptible.

The answer of Dr Icare of Smyrna is quite similar to that of Dr Raffinesque.

Dr Laidlaw is not prepared to deny that, under the circumstances influencing the communication of the disease by infection, communication by clothing of the sick may be possible; but, so far as his own experience goes, he has no evidence to offer that it actually takes place. He is in all other respects inclined rather to doubt and to deny all such communication. His observations and facts are extremely interesting, and we may take a subsequent opportunity of placing them at length before our readers.

Dr Gaetani Bey allows that certain objects which have been long in contact with the sick may communicate the disease, because, being impregnated with morbid exhalations, and possibly morbid products of every kind, both being absorbed, may, by the concurrence of epidemic causes, give rise to the distemper. The articles most likely to be impregnated and to communicate the disease are hair, feathers, hemp, cotton, silk, furs; articles unlikely are compact smooth bodies, as metals and inorganic substances; and some vegetable products, as wood, leaves, fruits, &c.



A number of facts and arguments very similar are given by the reporters. Those that we have now adduced, however, are sufficient to show the reasoning on both sides of the question. We have only to close this part of the statement with the conclusion given by the reporters, which is;—That numerous facts prove that goods and articles of clothing which have been used by plague patients have not communicated the disease to those persons who have used such articles without purification.

We should now proceed to consider another division of this part of the subject, namely, the question as to plague being transmitted by articles of merchandize supposed to contain pestilential materials. This question is closely connected with the previous one. The examination in the report is short though decided, and, on the whole, not unsatisfactory. The fullest statement of the question is given by Dr Laidlaw in his answers, and this we should subjoin, but for want of space at present. We hope on another occasion to be able to give his views at greater length. Meanwhile, we subjoin merely the general conclusion contained in the report. This is, that the communicability of plague by merchandize in countries in which the disease is endemic or epidemic, is by no means a demonstrated fact.

This conclusion is, it must be confessed, merely negative. But it must be remembered that the affirmative appears at present altogether in the form of an assumption. In short, when we consider the facts already mentioned of the cessation of the plague in Egypt at a definite time; the perfect immunity which the inhabitants enjoy between June and the beginning or end of December at all times; and the immunity which they occasionally enjoy for years; yet, with all the articles used by plague patients in full employment; it seems unreasonable to imagine that the disease is ever communicated in this way; and it seems not unreasonable to think that all the instances of alleged communication by suspected articles must have originated from some other causes. As to the alleged distinctions of susceptible and unsusceptible articles, it appears as if the persons who made them had never used their observation or intellectual faculties at all.

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ART. II.—*Clinical Collections and Observations in Surgery, made during an attendance on the Surgical Practice of St Bartholomew's Hospital.* By W. B. ORMEROD, Fellow of the Royal College of Surgeons of England, late House Surgeon at St Bartholomew's Hospital. London, 1846. 8vo. Pp. 312.

THE present volume contains a considerable amount of practical information on various diseases and accidents of frequent oc-

currence in large and populous cities ; and though most of the facts and pieces of professional information are well known to those who frequent the hospitals of the metropolis, and are familiar with the diseases and accidents most usually claiming attention in these large establishments, almost every one will take pleasure in perusing the authentic records of these casualties, as they are given by one who had good opportunities for observing them. It may be said, indeed, that to those who do not know much of these diseases and injuries, and their peculiar effects on the London constitution, this book will be both new and interesting. And, on the other hand, to those who do know them, it will be agreeable to see, traced by a faithful pencil, delineations of scenes which must have been neither infrequent nor uninteresting.

*Hæc quoque meminisse juvabit.*

This volume may in short be not improperly characterized as practice of surgery, and the treatment of diseases consequent on accidents and operations on the constitutions of Londoners and in the atmosphere of London.

Does the reader know any thing of this subject ? It is a very considerable mystery, and an undertaking by no means always void of difficulties. For instance, does the practitioner belong to one of the moderate sized towns of Shropshire, where he has the Wrekin constantly before his eyes or behind him, yet not out of sight, and does he imagine that in operating, or cutting or carving on a respectable Salopian peasant, he has to incur the same risks as he would do, were he treating a London mechanic ? If he does, he most seriously deceives himself. Is the practitioner located on the banks of the hoarse Severn, or the wandering Wye, with the Malverns and the Worcestershire Beacon staring him in the face ; and does he think, when he is treating the bruises, abrasions, and compound fractures of a Herefordshire peasant, that he is equally competent to manage those a London porter or drayman ? Let him beware how he falls into this not less dangerous hallucination. Let him read and study the present volume, and he will certainly become wise.

Hernia is the subject first considered. The author informs us of what is well known to all who know anything of large hospitals and their practice ; that very few patients with strangulated hernia apply for relief at first at St Bartholomew's Hospital. The generality are attended by the medical practitioner in the neighbourhood, and even by two or three different persons. The result of this is, that the proportion of patients operated on as compared with those admitted, is large ; that is, the herniæ are so much strangulated, that no hope is afforded by anything short of operation. Many, however, it is added, apply and have their ruptures reduced. The same patient often has his rupture reduced once

or twice, or even three times ; but the usual course is for the second strangulation to require the operation. Of those returned, the majority are cases of inguinal hernia, of moderate size, not long down, and not much handled. The number of cases of femoral hernia returned is much smaller.

Though, in inguinal hernia, a portion of bowel may form part of the protruded mass, yet more commonly in this than in crural hernia, the omentum is either protruded, or it forms to the protruded bowel adhesive attachments, which interfere much with the facility of reduction, either by taxis or operation. Mr Ormerod mentions, that within the last few years, five patients have been admitted for strangulated hernia, on whom the operation had been previously performed ; four again suffering strangulation from the same rupture, and one suffering from rupture of the opposite side. Of these three recovered ; one, having the hernia on the opposite side, died from peritonitis ; and one died from the omentum pressing the bowels high up. In four of these cases, omentum was found in the sac on the second operation. In those cases, in which the omentum exerted a hurtful influence on the bowels contained in the abdomen, it was attached either by one broad, or by two narrow adhesions, near the neck of the sac, or in the sac itself. It seems of little moment whether the adhesions be one or two, if they be firm and old ; for that seems to be the most unfavourable circumstance. Indeed, the attachment of the omentum in any mode is always an inauspicious character.

The following results are given as to thirty cases of strangulated hernia.—

“The patients admitted have often had the rupture strangulated for a considerable period. Of thirty patients operated on, the following are the periods which had elapsed between the strangulation of the hernia and the admission of the patient :—

“In 7 cases not more than thirteen hours had elapsed.

2 cases were operated on during the 1st day.

9 . . . . . 2d day.

5 . . . . . 3d day.

1 . . . . . 4th day.

2 . . . . . 5th day.

3 . . . . . 7th day.

1 . . . . . 15th day.

“Of these same thirty cases which were operated on at these periods, the taxis had been tried already before admission in six, by one medical man, and in two cases by two. Such were some of the serious drawbacks in this class of cases, where an early operation and as little handling as possible before operation have been always found so advantageous.”—P. 4.

The auxiliary means employed in attempting reduction by taxis were tobacco enema, the application of ice, and purgative clysters ;

venesection and the warm bath. Of the beneficial effects of the warm bath, the author speaks in strong terms of commendation ; and we think, on the whole, with good reason.

The most useful auxiliary agent, however, is decidedly and eminently generally blood-letting, not only from the degree of relaxation which it produces, but from its influence in counteracting inflammation, and abating that process if commenced.

“ Of thirty-one cases of strangulated hernia operated on, twelve were bled from the arm before the operation. Of these, three had peritonitis and four died, but in two, peritonitis had nothing to do with the death ; one dying suddenly on the twenty-fifth day without any particular cause, and the other having an internal strangulation of the bowel. This gives three cases in twelve, or one-fourth, as the proportion of peritonitis, where bleeding had been employed. Of the nineteen cases where no bleeding was performed before the operation, peritonitis occurred in ten instances, not including three cases of internal strangulation. This gives ten cases in nineteen, or rather more than one-half, as the proportion of peritonitis where no bleeding had been performed. This is quite proportion enough to get rid of any anxiety as to the danger of venesection—a measure which has been found of such repeated benefit in the reduction of hernia.

“ It is remarkable how slight a change is often produced by a very large venesection in the warm bath ; even the removal of sixty ounces of blood in a good stream has sometimes produced but an incomplete degree of fainting ; and in eight patients who were bled, the quantity of blood taken is only in one case marked so low as twenty ounces, whilst in the remaining seven it varies between thirty and forty ounces.”—P. 8.

Several interesting cases follow, illustrating peculiarities and complications. One of the most remarkable is a case of a young man who had a perfectly reducible rupture, and who was admitted in a dying state, yet without any indications external of strangulated hernia. Death took place in twenty minutes. Inspection showed a round ulcer perforating the duodenum, and allowing the contents of the canal to escape into the peritoneal cavity, which contained several pints of turbid sero-purulent fluid.

The subject of the second chapter is fracture of the ribs, lower jaw, and pelvis.

The first is a common accident among the labouring classes in a large and populous city. It is in general easily detected, because the individual cannot breathe without pain and uneasiness, so long as the ribs are allowed to move. This injury may or may not be followed by inflammation of the pleura and lungs, or by *bronchitis*. The following are the results of observation at St Bartholomew's.

“ Pneumonia and pleurisy occur very seldom indeed after ordinary fracture of the ribs, but slight bronchitis of the smaller tubes

is not at all uncommon. For many days after a rib has been broken, the injured side of the chest moves less freely, and the lung admits less air to move about in it, whilst a little intermediate, not small, crepitation may be heard low down on the injured side. This crepitation does not generally proceed to any degree of importance, but yields to the mildest measures, and often spontaneously.

"The employment of opium to relieve the distress of the patient, after fracture of the ribs, is attended with as great hazard as when this means is employed in chronic bronchitis. Although one rib is rarely broken by itself, and the number of fractured ribs is nearly always greater than can be felt, yet the number of ribs which may be broken with impunity is very large indeed, patients recovering at times when the side is regularly crushed in.

"Bronchitis is the most common accident from this injury; and as the patients have often already been subject to this affection of the chest in a chronic form, a broken rib often brings on a serious attack. A very severe case of this affection was in the hospital in 1840-1, where the mucus at last collected in such quantity that the man's life was in danger from suffocation. The ribs were very severely broken, but the man's death appeared to be at hand, and vomiting seemed to afford some hope of relieving him. A strong emetic was given; the man vomited profusely, without further injury to the ribs, and with great relief. He ultimately recovered.

"It is very remarkable how commonly people are bled, simply because their ribs are, or are supposed to be, broken. The reason is not very clear, but so commonly is bleeding performed under these circumstances, that poor patients occasionally consider its non-performance as an omission. This venesection can only have one, or perhaps two objects in view; the relief to the present difficulty in breathing, or a diminution of the chance of inflammation of the respiratory organs.

"The omission of venesection on the occurrence of fracture of the ribs is not followed by any bad effects which would be prevented by its performance; neither is it more likely to be required in a subsequent period of the case for having been omitted at first. The inflammation of the pleuræ, or lungs, which arises occasionally after this accident, does not depend in general on the plethoric condition of the individual, but on the injury inflicted on the structures themselves, and arises at a short period after its infliction. These affections of the respiratory organs are attended with the auscultatory signs and the general characters of thoracic disease, and require the same treatment, however much the ultimate chance of recovery may be compromised by the local injury.

"The relief by bleeding to the suffocative sensation caused by fracture of the ribs, has rarely appeared to be very decided, and certainly not so marked as to induce one to perform bleeding to relieve it. In short, venesection performed on the occurrence of fracture of the ribs does not appear to be attended with either immediate or ultimate benefit in a sufficiently marked degree to justify its general employment, even if this slight operation was free from risk;

and as fatal phlebitis has sometimes occurred from this very practice, its performance, except for urgent reasons, may reasonably be omitted."—Pp. 24-26.

We have two observations to offer on this class of cases and their effects, and the measures now spoken of.

The first is, that the occurrence of *pneumonia*, pleurisy, or *bronchitis*, depends very much on the manner in which the injury is inflicted, on the constitution and habits of the patient, and on his age. If the patient be young and vigorous, and not intemperate, then the most common result is slight pleurisy, which subsides without treatment, or at most by restrained diet, and keeping the chest from moving; though that the patient generally instinctively avoids. If he be stout, plethoric, and middle-aged, he is almost sure to have an attack of pleurisy with pneumonia; and the venesection is, if not absolutely necessary, at least very useful. And lastly, if the patient be liable to winter cough, or be a free liver, or a drinker of porter, or half-and-half, or similar seductive liquors, or a little up in years, with a wheezing state of the air-passages in the winter time, he is almost sure to have pretty severe *bronchitis*, requiring blood-letting and restrained diet, with blisters and nauseants.

Again, if the patient have been crushed between two compressing forces, or has had a heavy fall previous to the fracture of the ribs, he is almost sure to have pneumonia and pleurisy, and that not of a good type.

We perfectly agree with Mr Ormerod, that in many cases of fracture of the ribs, even in the labouring classes, venesection is not necessary; for even in them, if temperate, the injury heals readily and without accident. At the same time, from the numbers of cases in which symptoms either of pleurisy or *bronchitis* take place, and from those cases in which, after fracture of the ribs, more or less adhesion is observed, it appears that, on the whole, it is wise to watch these cases, and bleed, if the symptoms, especially the thoracic oppression, seem to require it.

The second remark which we have to offer is, that if, in any given case, blood-letting be required, it would be wrong to defer it, from the dread of the operation being followed by *phlebitis*. We are perfectly willing to admit, that the occurrence of venous inflammation after venesection is more frequent in large towns, and especially in the London atmosphere and London constitutions, than elsewhere. But one great reason why this accident is so common there after venesection is, that operators are in the habit of closing the wound in the vein, or stopping the flow of blood, by placing the finger over or in the wound, and thus applying it to the inner coat of the vein. This filthy practice, which has been somehow introduced into all the large hospitals, and which, probably, is to be traced to the coarse practice of the army surgeons

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in placing their fingers over bleeding vessels, is productive of many cases of *phlebitis*; and almost as certainly as the finger is there placed, is the inflammation of the vein sure to follow. If any one doubts this, let him try the effect of giving it up, and stopping the bleeding, as a good surgeon will always do, by placing his finger, not over the lips of the wound, but over the sound skin covering the vein below the wound.

But some wise gentleman will say, how can placing the finger over the lips of the wound cause *phlebitis*? I have done so hundreds of times, and no *phlebitis* has followed. This, we are sure, is one of those reckless general statements, so often made in medical and surgical practice on very insufficient grounds. In one or two instances in which the finger is so placed over the wound, *phlebitis* does not follow, because the skin and perspirable matter of the operator is not applied to the inner surface of the vein. But in all cases where the wound is sufficiently large, to allow the skin of the finger to touch in any way, either laterally or at the bottom of the wound, the inner venous coat, that inner venous coat will most certainly become inflamed; and all the usual consequences of *phlebitis* will ensue;—death in a few days;—or imperfect recovery, followed by purulent deposits within the membranes and in the joints; and death by slow hectic.

The reason of all this is, that the surface and perspiration of the skin of the finger thus applied acts as an irritant to the inner venous membrane, and so causes inflammation and its consequences. In some favourable cases, in which the wound is so circumstanced, that the skin of the finger does not touch the inner coat of the vein, which, either from the quantity of cellular fat or other causes, may be a little deep, the vein does not inflame; but this is a rare occurrence in this sort of careless accident.

We do not by all this deny some influence of the constitution of the individual, and some by the London atmosphere. But we contend that no constitution, however good, and no atmosphere, however pure, is capable of counteracting the effects of applying this poison to the inner venous membrane. The practical inference is;—Never touch the wound in the vein with the finger; never force the finger into the wound.

A consequence not very uncommon of the fracture of the ribs, produced by crushing or compression between two heavy bodies, is, with or without laceration of the pleura, the effusion of blood within its cavity. A good example of this accident is given at page 27, where a brewer's servant was crushed between a wheel and a wall so as to fracture four ribs on the right side before and behind. The pleura was not injured, but much blood was effused under the costal pleura.

In other instances, as of heavy bodies passing over the chest, for example the wheel of a carriage or wain, the *bronchi* may be

ruptured, and emphysema produced. Of this an instance is given at page 28.

In treating of bursal tumours, and the best mode of managing them, Mr Ormerod, without disapproving of the application of blisters or the tincture of iodine, the introduction of a thread, or the evacuation of the fluid by puncture, thinks, that when from the pain, heat, and swelling, there is reason to believe that suppuration has taken place, opening by a free incision is the most effectual plan, and not liable, as is commonly supposed, to any bad consequences. He thinks that bad and unfavourable accidents have not followed opening these cavities where purulent matter has been formed. This doctrine even he seems to apply to the enlargement of the bursa over the patella.

With this doctrine we are partly disposed to agree. We have opened by free incision bursæ which have, under the influence of acute inflammation, proceeded to suppuration; and the cavity has assumed healthy action, and the wound healed well and favourable. And even in the case of the bursa over the patella, we have found it necessary to open the tumour by incision, in order to allow the escape of purulent fluid which had been there formed. Yet the patient, a female, made a perfectly good recovery, though it was tedious; and she retained the perfect use of the joint.

We believe, nevertheless, that to this doctrine certain limitations ought to be made. There are certain bursæ which communicate directly with the interior of joints, and others which do not; and of the former, we believe that occasionally the communication in some is cut off by adhesive inflammation. In all cases in which a bursa communicates directly with the interior of a joint, we believe that an opening is hazardous, if not positively injurious; and if incision ever be deemed necessary, by the formation of a fluid which cannot be expected to be absorbed, the surgeon must lay his account with having to contend against very serious local inflammation and general disorder. On the other hand, in ordinary cases of swellings of bursæ not communicating with the interior of joints, or in which that communication has been interrupted by the formation of adhesions, experience concurs to show that incisions may be made into them, without more than ordinary risk. As to incisions into bursæ communicating with joints, they seem to be attended in general with dangerous, if not fatal consequences. More than one case of amputation below the knee we have seen terminate fatally, merely because the incisions were carried through *bursæ* communicating in that region with the cavity of the joint.

The author closes this chapter with the description of a bursal or synovial swelling round the tendons of the knee-joint, an affection not uncommon as a consequence of attacks of synovial rheumatism.



This article we began by saying that accidents and injuries in London are greatly under the influence of the constitution and habits of the individuals who sustain these injuries. This is a bit of a truism for which we believe some readers will not thank us. Yet, truistical as it is, it seems not always to be fully borne in mind. There is brought into the surgery or waiting room a stout jolly-looking drayman with his face a fine rosy colour, and the whole man a mass of apparently good substantial flesh and blood. What is the matter with him? His leg has got a slight crush between two casks; no bone is broken; and all that can be recognized is a bruise of the soft parts. That man, however, has got his quietus. In thirty-six hours his pulse is frequent and small, his tongue dry and brown, he is a little delirious, and subsultus is distinct. The limb is hot, swelled, tense, and painful, and of a brown-red colour, bluish in some parts, and with a tinge of yellow in others. Emphysematous crepitation is manifest; phlyctænæ arise; and, in two days more, the stout rosy-faced drayman is gone.

A stout porter walks in on his own legs, and wishes to have the surgeon's opinion on an injury of the leg. He was descending from a cart, and grazed his leg on a bar of iron. There is a considerable detachment of the cuticle; a little space the skin is injured; the leg, however, does not look ill; but the surgeon gives him some directions and a prescription, and tells him if he is worse to-morrow, to come back or let him know. The man spends a bad night, and is much worse. He has been out of his mind, his neighbours say; and, in short, he cannot be kept quiet; yet he is unable to go out and work. To the hospital he is brought. Applications and treatment are commenced systematically. But for these the effects of the injury are greatly too speedy. These effects, indeed, advance most rapidly; the man has got *delirium tremens*; and besides that, the leg is extensively inflamed, and beginning to slough. Death ensues, however, on the fourth day, and takes the matter out of the surgeon's hands.

Such are a few of the casualties and adventures of a metropolitan hospital. The numbers of persons who die in one or other of the modes now mentioned, or somewhat very similar, is inconceivably great. All these people live in cellars or attics; sleep in confined apartments, where they inhale the whole of the available oxygen, and a large quantity of carburetted hydrogen, azote, and other deleterious gases, amidst eight or ten inmates; and to compensate for the want of vital air during the night, they have a good deal during the day, with large potations of porter, stout, half-and-half, and now and then a quartern of gin. They look plump, strong, and vigorous; but the foe is at work internally. No man can drink daily five or six quarts of stout, and the usual amount of gin, without these pleasant potables finding their way to

the blood and arteries, his liver, and his kidneys; and so, after the lapse of some years, the brewers and gin-shop keepers always and invariably manufacture for the London hospitals and dispensaries a very great number, it may be said, thousands of cases of diseased arteries, aneurisms, cirrhotic livers, and granular kidneys, with the morbid state of the blood attending these conditions. Is not this a grand idea—a magnificent arrangement!—the brewers and the gin-shop keepers actually making morbid preparations for the London hospitals and hospital schools; and working away night and day in providing materials for making intelligent physicians, experienced surgeons, and skilful pathologists. And thus it ever is. God is merciful, and brings good out of evil; so that, when man contrives evil on every hand, good is nevertheless brought out of it.

One only idea naturally rises in a reflecting mind on this subject; and this is, whether, if these people—porters, draymen, and others, often hard-working printers, carpenters, and bricklayers,—were aware of the terminus to which this railroad of porter, ale, and gin were carrying them, they would so complacently enter the train, and allow themselves to be carried along by it. Several years ago, the Royal College of Surgeons of Edinburgh, with a degree of liberality which does them great credit, opened to the public their select and valuable museum of morbid anatomy, and by all means encouraged visitors of the lower ranks of society to inspect and see the multiplied forms of disease incident to the organs of the human body. One of the objects of this kindness was to enlighten the minds of the public, and diminish the prejudice against dissection. It must have been from downright diffidence and modesty in the learned College, and from knowledge of the contradictory opinions entertained on the exact causes of diseases, that this body did not direct to be marked over the various classes of morbid specimens, some edifying epigraphs like the following:—This is the liver produced by whisky; these kidneys are the effects of dram drinking; the man, from whom this preparation was obtained, was never exactly drunk, but he was rarely sober.

This subject has engaged the attention of the author as a pathological observer, and his observations deserve to be read and studied.

“There are certain occupations and trades in London which are especially drunken trades, and the simple fact of a person belonging to them is a very bad prognostic for sickness. These persons do not, however, drink at random, or drink anything, but each particular class drink after a certain rule, follow the same habits, and present nearly the same appearance. They all come to pretty much the same end at last, but they reach it by different roads.

“The great beer drinkers, draymen, coal-whippers, and water-

men, work much in the open air, exercise their limbs most powerfully, and though seldom of a healthy appearance, often have the size as well as the power of the finest and healthiest countrymen. These men are especially contrasted with the great spirit drinkers, who work in a hot close atmosphere, only employ some of their limbs, and often work at night or at late hours: such are often newspaper compositors and tailors. These are the two extremes of a class; their habits and occupations are utterly different; their faults take a different turn from the same road, and the two classes present a totally different appearance for a certain time.

"These men are, so to speak, moderately well off; their wages are good, their occupation pretty regular, and they are not the really poor. There are, however, many trades which are followed by the poor in mind and the weak in body, the wages of which are never high, and often uncertain: the employment of these persons hardly ceases day or night, exposes them to the greatest changes in weather, and they often serve masters little above themselves. Amongst these are waiters at low taverns, stablemen at livery stables, and prostitutes. These drink neither beer nor spirits in the same extreme degree as the two other classes, but they drink a great deal of anything in small quantities, live on bad food, and poverty often presses very hard upon them.

"These are the habits of some few classes of the persons who form the patients of a London hospital; their life ends not unfrequently in disease, which brings them under the care of the physician; but engaged in a trade, they are liable to accidents, and are then found in the surgical wards. Here their accident alone brings them; they believe themselves to be otherwise well; but the condition of body which their habits have established, though it may not have rendered disease visible by its effects, may already have done enough to prevent their rallying from even a slight accident; for the power which has enabled them to go smoothly and actively on up to the present time, may not be sufficient to overcome any sudden check, or to correct an injury in the body itself.

"The stout unhealthy drayman, who takes much of his nourishment in beer, differs often as much in sickness as in health from the pale and weakly ostler or waiter, who drinks what he can get, and works at irregular hours. The drayman is rare as an hospital patient, except for a wound on the leg, or a fracture; and then, if his ailments are accompanied with erysipelas or delirium tremens, they are often of the most destructive and violent kind: his life sometimes being lost within a few days from the sudden prostration of his powers, by extensive sloughing of the limb, or the continuous violence of the delirium. The ostler and tavern waiter, with others that come very near them in habits, the knacker and the nightman, are very common hospital patients, for little things, but those very hard to cure. Bad ulcers of the legs with irregular inflammation round them, abscesses from slight causes and wounds, which are tardy of healing, form their chief ailments, whilst low erysipelas occurs very readily in them, and they bear no active treatment. The bad leg of this last class is sometimes very severe, and bores

deeply and widely amongst the surrounding tissues. In the sore leg of a nightman the anterior tibial artery burst, and in a similar disease of a stable-man the posterior tibial artery gave way from the extension of ulceration, and in both cases the patients ultimately died.

"The effects of constant drinking tell by the general change on the habit and power, as well as by the production of disease; but it is extremely hard to say what degree of drinking short of the production of disease is hurtful. That it does tell appears to be beyond doubt, but every now and then some habitual drunkard resists the powers of disease in a degree equal to that of the healthiest man. These cases are, however, exceptions, and the patient by his own words sometimes announces that he considers his recovery, after such a mode of life, as contrary even to his own expectation.

"Of all diseases of internal organs produced by drinking, the granular liver seems to have attracted most attention. Perhaps justly; but there is no doubt that of all organic diseases, the two most to be feared in intemperate persons with recent surgical injuries are, the granular kidney, and slight but general emphysema, with a dilated, but not always much diseased, heart; and in persons past the middle period of life, dying rapidly in hospitals after operations and surgical injuries, combined with much loss of blood, these two affections of the urinary and respiratory organs are very far from uncommon."—Pp. 97-99.

This is a tolerably accurate picture of the conjoined effects which flow from various causes—drinking of stimulating, alcoholic, and intoxicating, that is, poisonous beverages; excessive labour and corporeal exertion, which demand for their aid all this stimulation and artificial excitement; irregular meals, not always of the most nutritious character; sleeping in apartments supplied with little fresh air, and that not sufficient by any means for their numerous occupants. The general summary of all these evils, especially that of the drinking, is given in the following extract.

"The three chief affections destroying patients, after operations and injuries—the general habit produced by drinking; secondly, organic disease in the lungs and kidneys, especially emphysema in the former, and granular disease in the latter; and thirdly, tubercle—act very differently, and at different periods. During the early period, and often for weeks after operations, patients labouring under tubercular disease do well; and it is often only at the absolute return to health, rather than during the recovery from the operation itself, that the effects of tubercle begin to show themselves. Organic disease produced by drunkenness, and habitual drunkenness, act differently; the organic disease presses heavily at every period, and may destroy life either early or late; but the mere habits of the drunkard show themselves chiefly at a very early period. The patient, who nearly sinks from his unsound organs within the few first days, often lags on for days and weeks in danger; but the man who has simple delirium tremens is taken ill directly, and often

dies, but if he recovers from his delirium he generally gets well from the operation, and sometimes quickly."—P. 101.

The facts now stated are not by any means new. They were well known, and have been well known for one quarter, aye for half a century; for so long, and longer, it may be said, has this state of matters been going forward, in London particularly, and in other large and populous towns. They are, however, well brought forward in the present volume, so far as they are subjects of medical and pathological inquiry. It would be idle to say that we have nothing to do with them in any other point of view. In some respects this is correct; in others it is false. It is quite impossible to know this state of matters, without considering it in all its bearings; its causes; its effects; its relations, social and civil; and above all, the condition of the class of society which are mostly the victims of this mode of existence. Our limits, however, will not allow us here to enter into all these points, which must be reserved for separate consideration. All that we say here is, that all these evils are distinctly traceable to the degraded and pauperized and irregular habits of the working classes in London. Employment is precarious and unsteady, and will not afford them constant and regular meals. Labour is at one time most incessant and urgent, and demands the stimulant aid of the porter-pot and the gin-glass. House-rent is so high, that they are compelled to sleep at the rate of six or eight in one apartment. Window taxes must be paid, and even poor-rates must be contributed; while, by indirect taxation for malt liquor and other articles, so much is consumed, that little or nothing is left for soap, or clothing, or anything that would really contribute to health and comfort. The air these poor creatures breathe, and the light which is admitted into their confined dirty habitations, is in one way or other taxed.

Meanwhile, the attention of the members of government is directed to what is called the sanitary state of the poor and working classes; and well may it be so directed. But it does not occur to government, that they have made the people what they at present are. They have, by taxation and every means of diminishing the comforts of the working classes, and raising the price of the commonest necessities of life, made them greatly worse than the beasts that perish; and now, when they find they are so, they propose to make them better by sanitary measures. A more Utopian idea never entered into the head of any inhabitant of Bedlam. The state to which we have referred, no sanitary measure can ever reach. It is beginning at the wrong end; and after taking much pains to govern ill, it is taking a little more to govern officiously, in order to check or neutralize the bad effects of misgovernment. We must, however, leave this subject at present, with the hope of recurring to it at another opportunity.

Only one other subject can be noticed from this useful volume at present.

Among the disorders to which females are liable, retention of the menstrual discharge is one very troublesome, though sometimes difficult of recognition. The female menstruates and looks well in the face, and otherwise like a woman in whom the uterine function is duly performed. Still the usual quantity of blood is not discharged. She suffers from the ordinary periodical feelings and disorders. The abdomen, especially the hypogastric region, swells; foolish and officious persons shake their heads; and malignant tongues are busy in damaging the patient's character. The patient, indeed, suffers enough of bodily torture without having this of the mind added to it. But this also is her portion, and this she must endure. The cause of all this mischief is various. Sometimes the vagina is obliterated, or its mucous membrane is adherent from inflammation and granulation, at an early period of life. Sometimes a mere membrane blocks up the passage, either immediately below the *os uteri* or a little farther down; and the menstrual secretions of many months are accumulated within the womb. In either case, operation by slitting cautiously the vagina, or puncturing or dividing the membrane, effects an opening, and allows the escape of the retained blood.

The following case is given by Mr Ormerod, and illustrates happily the nature and cause of the disorder.

"A healthy unmarried girl, aged seventeen, was sent up from the country to the hospital for inability to empty her bladder, and was admitted under Mr Lawrence. Till the last few days she had followed her employment as a servant, and, till the present difficulty of passing her water occurred, she had considered herself as well. A catheter was introduced by the house-surgeon into the bladder with great difficulty. The size was only a No. 2 gum catheter, and it seemed to pass vertically upwards, close behind the *os pubis*, through a urethra four or five inches long. The chief impediment seemed to be the narrowing of the urethra by firm pressure from behind forwards. About one pint or more of high-coloured urine was thus drawn off, with great relief to the patient.

"The immediate urgency of her ailments was thus relieved. The following circumstances were made out then and afterwards. The vagina was closed by a membrane at a point situated rather behind the orifice of the urethra, near the situation of the hymen. A firm, apparently solid tumour filled the hollow of the sacrum, and pressed the rectum so much backwards, that the finger could only be passed behind it with difficulty. She had never menstruated, but had never been troubled with much pain in the loins, or bearing down pains, and only occasionally suffered from headach.

"She applied on the Friday: at seven o'clock on the following morning the nurse called the house-surgeon, to say the patient was flooding. The bed contained a quantity of blood, smelling like putrid fish. The blood was still running from the vagina, but the patient was quite calm and comfortable, and showed no signs of loss of blood. The tumour pressing on the rectum was now gone, the

septum had burst, and the finger could be passed through it to a considerable distance without feeling the *os uteri*. She got quite well, and menstruated in one month dating from her admission into the hospital.

"The first suggestion arising to the reader will probably be. Here was a plain case of collection of the menses, and it might have been tapped at once, and the bladder relieved. The fact is this. The woman came late in the day; the prominent symptoms were relieved, no danger existed, and the patient remained in the house for the surgical visit next day. The history of cases often comes from the patient little by little, and until the membrane burst, the house-surgeon, which was myself, had no very clear idea what the absolute cause of the retention was."—Pp. 163-164.

To this case we have little or nothing to add.

We ought to continue our account a little further; but we are prevented by the necessity of attending to other matters. On a subsequent occasion we may return to the volume of Mr Ormerod. Meanwhile, we believe we have said enough to show that it contains matter which will make it an instructive book to all surgical readers. They will find in it much practical information, which deserves not one perusal but several; and they will find facts which will awaken many useful and profitable reflections.

**ART. III.—*Draft of a Bill for the Improvement of the Health of Towns. With abstract of the Speech of Lord Morpeth on Introducing the Bill.***

ON Thursday, the 18th of March 1847, Lord Morpeth, First Commissioner of Land Revenue, and Chief Commissioner of Woods and Forests, announced to the House of Commons his intention to introduce a bill for the improvement of the health of towns, and for effecting various sanitary measures in connection with that object. On Tuesday, the 30th March, his Lordship obtained leave to introduce the bill, explained at the same time the reasons which rendered this measure requisite; and gave a full statement of the condition of the working and poor classes in the large and populous towns.

The main reason was founded on the high mortality of the population of towns compared with that of rural districts; and, above all, the high mortality among the labouring classes of the population. In other respects the reasons were very much the same as those which we have at different times brought forward in this Journal, when noticing the *Registrar-General's Reports*; and, above all, when noticing that of the third quarter of 1846, which was done in our sixty-seventh volume, p. 224.

These reasons it is unnecessary again to recapitulate. We shall merely put down here the numerical statements as given by

the Registrar-General of the mortality of the country generally, with that of several populous towns.

|                           |          |
|---------------------------|----------|
| Mortality in the country, | 1 in 52  |
| London,                   | 1 in 39  |
| Manchester,               | 1 in 30  |
| Liverpool,                | 1 in 29  |
| all England,              | 1 in 45. |

The reason for this will appear presently.

All the world is aware that upon this subject very elaborate and pretty expensive inquiries have been carried on for a series of from six or seven to ten years; and facts which were perfectly well known to many hundreds, we may almost say thousands of persons in London, Liverpool, Manchester, Birmingham, Glasgow, and Edinburgh, have been collected and embodied in various official reports. These facts relate to the degraded, wretched, and helpless condition of the working classes in large towns, the non-working classes, or what may be called waiters-on Providence, the dangerous classes of the French, and the little working, part begging, part thieving classes. The condition of these people, their morals, or rather their total want of morals, the wretchedness and irregularity in which they live, and the misery and helplessness in which they are assailed by disease, and die, were all perfectly well known to many people in the towns, in which these people picked up their precarious and irregular subsistence. It was quite right that the whole of this should be recorded; because it is a rule in England, that no legislative measure should ever be thought of, much less brought forward, without a previous knowledge of facts and necessities.

Upon the condition of this great mass of social corruptibility is the Sanitary or Health of Towns' Bill founded. The author of the bill proposes to improve the health of towns by introducing various measures for draining places requiring drains, furnishing proper and adequate supplies of water, keeping streets and lanes clean and well ventilated, causing the removal of nuisances, and in short doing every thing that may be conceived necessary to provide pure fresh air, plenty of water, and to remove filth from the dwellings of the inhabitants of populous towns.

The measure is recommended by good intentions. But it is totally inadequate to the objects; and not only will it never effect them, but it will be a lasting monument of the folly of legislation on such a subject.

For this opinion several very substantial reasons may be assigned. But we shall advert only to a few, as our limits do not permit us to write a dissertation on this subject.

In the first place, the whole Commission, with Lord Morpeth at their head, are as perfectly at sea on this subject, as ever a ship's company without compass, chronometer, or sextant, were



in their lives. With all their inquiries and all their facts as to the wretchedness, poverty, crowding, confined, and ill-aired dwellings of the working and half-working classes, they have not arrived at the true cause of all this misery and indigence, which lies much nearer the surface than these sagacious persons have been able to see.

They have never yet proposed the question, what makes these poor and hard-working or no-working people live in these places and in this manner? Nothing but absolute necessity, downright grinding poverty, and the entire incapacity to provide either better houses, better beds, better clothing, better or more regular supplies of food. Employment is neither constant nor regular; it is in short precarious; wages are not high, at least not sufficiently so to enable them to pay house-rent, clothing, and food. Then a man may be out of work two or three days in the week; or two or three weeks in the month; and the result is more easily imagined than described. Then all the necessities of life are high-priced, at least high-priced considering the limited and uncertain means of these poor people. Bread, butter, cheese, eggs, all must be paid for out of their limited means. Animal food they rarely see, except at extraordinary occasions. How is it possible that persons in this situation can either find soap and water to cleanse their persons or clothing, or can afford well-aired houses, or even procure fuel to warm and ventilate them in winter and the cold damp days of spring and autumn? The thing is a mere impossibility, physical, financial, and of every sort.

It is quite unnecessary to go, in order to prove these statements, to the numerical statistics of the question, or to show the revenues and expenses of this class of society. That has been done so often, that we presume every one, even most ignorant on matters of this kind, is aware of the facts.

Now, the natural question is, what has produced, and what is maintaining this wretched state of matters as to the labouring and half-working classes? The answer is, chiefly taxation and its multiplied effects. Soap is taxed; coals in London are taxed; bread and grain have been highly taxed, till within the last twelve months; tea and coffee, almost necessities to many of these people, are well taxed; the ground on which their houses are built is most highly and exorbitantly priced, often at its longitudinal value in silver; the houses which they occupy are, however wretched and incommodious, highly rented; the air is taxed; the light is taxed; the water must be paid for in some way or other; and to conclude all properly, the man who works hard, and saves by pinching and sparing, is taxed to maintain his less fortunate or less active companions, within the walls of the workhouse.

How can legislative measures be applied to alleviate or to diminish any one of these numerous heavy and oppressive evils?

The Chief Commissioner of Woods and Forests will explain. He is to provide better, and larger, and well-ventilated houses. The landlords are to be induced to lower the ground-rents to a very moderate figure. He is to give plenty of water, in order to enable the inhabitants to keep clean houses, to purify their persons and wash their clothes. The duty on soap and tallow is to be entirely removed. Leather is to be untaxed, in order to enable them to get shoes and boots. The window-tax is to be repealed, that light and air may be admitted into their apartments. Tea, coffee, and sugar, are to be imported duty free, or at a very low nominal duty. The rate of wages for labour is to be raised; employment is to be rendered steady and regular to all who choose to work; and in short, all means of comfort and ease are to be placed within the reach of the industrious, diligent, and well-conducted workman. His wife shall no longer be seen a dirty, half-clad slattern, amidst four or five dirty, squalid, vicious-looking children, in a dirty room, with one or two windows patched with paper, and cleaned sometime in the reign of George III. She will no longer be seen going to the gin-shop with the last three halfpence, but in the aspect of a decent, cleanly, sober, and steady-looking female, with her children attired, if not in good and quite whole garments, at least clean and well patched. The elder children also attend the industrial schools in the district, and never pawn their Bible or Prayer-book, as was the case before the auspicious year of 1847.

*Magnus ab integro sæclorum nascitur ordo ;  
Jam nova progenies cœlo demittitur alto.  
Te duce, si qua manent sceleris vestigia nostri,  
Irrita perpetua solvent formidine terras.*

The seriousness and sincerity of legislators can often be distinguished and estimated by very small circumstances. Amidst the nebular mist with which all new attempts at legislation, and especially proposed improvements, are involved, it is generally possible to descry some clear and brilliant point, which tells, as accurately as if the legislator's breast was constructed according to the ingenious device of Momus, what are his real intentions. In this case, a very small circumstance occurred which revealed the total extent of the noble legislator's intentions.

On the evening of Friday the 19th March, the evening following this memorable exposition of the benevolent intentions of the First Commissioner, Lord Duncan proposed the question, whether any alteration was contemplated in the mode of assessing the window-tax,—a subject which had a close connection with the bill introduced by the noble Lord for the improvement of the health of towns? Lord Duncan was induced to ask this question, because the noble Lord, as one of the directors of the Metropolitan Association for Improving the Dwellings of the Industrious Classes, had sanctioned a report issued by that association,

in which it was stated that "the directors had bestowed much time on the question of the window-tax, as bearing upon the dwellings proposed to be erected by the association; and though the tax, according to the present mode of assessment, would bear heavily upon the tenants, they confidently hoped that an alteration in the mode of rating would shortly be effected."

To this Lord Morpeth replied that he quite agreed with his noble friend, that the subject of the window-tax was closely connected with sanitary considerations; but his noble friend must admit, that the window-tax was also a financial question; and with respect to the mode of assessment as a tax, he begged to inform his noble friend, that he had received no intimation from the Chancellor of Exchequer, that it was his right honourable friend's intention to give up his office, and leave him, Lord Morpeth, at liberty to deal with the window duties.

Now the beauty and eloquence of this answer is, that it is so perfectly sincere, and so free from anything like petulance, irony, or sarcasm. Of course the honourable interrogator was perfectly satisfied with this polite and satisfactory reply.

No one can doubt that the window-tax has been of inestimable service to domestic architecture and internal accommodation; that it has contributed to enlighten and ventilate places that were previously without either light or air; and that it has raised the whole body of the population in the scale of society. The man who is conscious of paying for window-light is a superior sort of being; and the fact proves that he has got an immortal soul and intellect as certainly as his ragged coat proves the existence of cloth-weavers and tailors. How foolish, then, was it in Lord Duncan to propose this frivolous question?

Other inquiries have since been made regarding other points with which the provisions of this embryo bill are more or less closely connected. For instance it was asked, would the landlords reduce the rate of the ground rents from 10s. or 15s. to 1d. or 2d. the foot? The answer was, it was a financial question, and it was not understood that the landlords were prepared to give up their vested rights and patrimonial interests. Then the question was put, whether the rents of houses were to be lowered? The answer was, it was a financial question, and it could not be expected that builders, bricklayers, and carpenters were to construct houses, and not to receive value for their materials and workmanship. Another question proposed was, would the water companies supply water gratuitously or at a low rate to the class of houses occupied by the working population? The answer was, that this also was a financial question; that the companies had invested a large capital in bringing water into the city, and incurred a constant expense in keeping machinery, cisterns, and pipes in repair; that it was a ruinous speculation, paying not more than eight or nine

per cent., and that in the meantime they were obliged reluctantly to answer in the negative.

These considerations have induced the noble legislator to modify somewhat his measure since it was first brought under the notice of the House. The metropolis is to be entirely exempted from the operations of the provisions of the bill. It is not at all a new thing to propose to perform the tragedy of Hamlet, keeping out entirely the character of the Prince of Denmark. This is to be the case with the great sanitary measure of the Chief Commissioner of Woods and Forests. The population of London is in such a state of comfort and perfect health, and their municipal government is so paternal, that they required no sanitary measure. But the provincial towns, who are less fortunately situate, are to be embraced in its provisions.

Some persons would doubt the wisdom or necessity of any bill for the improvement of the health of towns at all, after this ominous commencement. It may be argued, for instance, if London is in such a state of perfect health, a place containing two millions of human beings, of whom one million at least scarcely know in the morning when they rise, whence their daily bread is to come, *a fortiori*, surely, such petty villages as Birmingham, Liverpool, Manchester, and Glasgow, all with populations not above 400,000 souls, might do as they have heretofore done, without any sanitary measures. They are, indeed, mere rural villages compared with the metropolis.

Again, it may be said, will the sanitary measures do the good expected from them, without the previous condition of relieving the burdens, and lightening the oppression which weigh so heavily on the working classes? A person who was termed by a presumptuous and conceited literary nobleman an inspired idiot, has two verses which are not inapplicable.

“How small of all that human hearts endure

“That part which laws or kings can cause or cure.”

It is from over-government, officious interference with the natural course of events and the progress of society, and a constant desire to meddle with every transaction between man and man, that all the mischief is produced. If legislators would calmly sit down and do nothing, things would proceed greatly better than they do by their interference, and would, in the majority of cases, right themselves. They certainly could not proceed worse.

We agree with the inspired idiot in thinking that, of the multiplied ills borne by the human race, neither laws or statesmen can cure much. But we think that their impertinent and foolish interference often contributes largely to those evils; and that, if they would govern less and leave every one to look after his own affairs and interest in his own way, the world would be greatly better conducted than it at present is, and hitherto has been.

men, work much in the open air, exercise their limbs most powerfully, and though seldom of a healthy appearance, often have the size as well as the power of the finest and healthiest countrymen. These men are especially contrasted with the great spirit drinkers, who work in a hot close atmosphere, only employ some of their limbs, and often work at night or at late hours: such are often newspaper compositors and tailors. These are the two extremes of a class; their habits and occupations are utterly different; their faults take a different turn from the same road, and the two classes present a totally different appearance for a certain time.

"These men are, so to speak, moderately well off; their wages are good, their occupation pretty regular, and they are not the really poor. There are, however, many trades which are followed by the poor in mind and the weak in body, the wages of which are never high, and often uncertain: the employment of these persons hardly ceases day or night, exposes them to the greatest changes in weather, and they often serve masters little above themselves. Amongst these are waiters at low taverns, stablemen at livery stables, and prostitutes. These drink neither beer nor spirits in the same extreme degree as the two other classes, but they drink a great deal of anything in small quantities, live on bad food, and poverty often presses very hard upon them.

"These are the habits of some few classes of the persons who form the patients of a London hospital; their life ends not unfrequently in disease, which brings them under the care of the physician; but engaged in a trade, they are liable to accidents, and are then found in the surgical wards. Here their accident alone brings them; they believe themselves to be otherwise well; but the condition of body which their habits have established, though it may not have rendered disease visible by its effects, may already have done enough to prevent their rallying from even a slight accident; for the power which has enabled them to go smoothly and actively on up to the present time, may not be sufficient to overcome any sudden check, or to correct an injury in the body itself.

"The stout unhealthy drayman, who takes much of his nourishment in beer, differs often as much in sickness as in health from the pale and weakly ostler or waiter, who drinks what he can get, and works at irregular hours. The drayman is rare as an hospital patient, except for a wound on the leg, or a fracture; and then, if his ailments are accompanied with erysipelas or delirium tremens, they are often of the most destructive and violent kind: his life sometimes being lost within a few days from the sudden prostration of his powers, by extensive sloughing of the limb, or the continuous violence of the delirium. The ostler and tavern waiter, with others that come very near them in habits, the knacker and the nightman, are very common hospital patients, for little things, but those very hard to cure. Bad ulcers of the legs with irregular inflammation round them, abscesses from slight causes and wounds, which are tardy of healing, form their chief ailments, whilst low erysipelas occurs very readily in them, and they bear no active treatment. The bad leg of this last class is sometimes very severe, and bores

deeply and widely amongst the surrounding tissues. In the sore leg of a nightman the anterior tibial artery burst, and in a similar disease of a stable-man the posterior tibial artery gave way from the extension of ulceration, and in both cases the patients ultimately died.

"The effects of constant drinking tell by the general change on the habit and power, as well as by the production of disease; but it is extremely hard to say what degree of drinking short of the production of disease is hurtful. That it does tell appears to be beyond doubt, but every now and then some habitual drunkard resists the powers of disease in a degree equal to that of the healthiest man. These cases are, however, exceptions, and the patient by his own words sometimes announces that he considers his recovery, after such a mode of life, as contrary even to his own expectation.

"Of all diseases of internal organs produced by drinking, the granular liver seems to have attracted most attention. Perhaps justly; but there is no doubt that of all organic diseases, the two most to be feared in intemperate persons with recent surgical injuries are, the granular kidney, and slight but general emphysema, with a dilated, but not always much diseased, heart; and in persons past the middle period of life, dying rapidly in hospitals after operations and surgical injuries, combined with much loss of blood, these two affections of the urinary and respiratory organs are very far from uncommon."—Pp. 97–99.

This is a tolerably accurate picture of the conjoined effects which flow from various causes—drinking of stimulating, alcoholic, and intoxicating, that is, poisonous beverages; excessive labour and corporeal exertion, which demand for their aid all this stimulation and artificial excitement; irregular meals, not always of the most nutritious character; sleeping in apartments supplied with little fresh air, and that not sufficient by any means for their numerous occupants. The general summary of all these evils, especially that of the drinking, is given in the following extract.

"The three chief affections destroying patients, after operations and injuries—the general habit produced by drinking; secondly, organic disease in the lungs and kidneys, especially emphysema in the former, and granular disease in the latter; and thirdly, tubercle—act very differently, and at different periods. During the early period, and often for weeks after operations, patients labouring under tubercular disease do well; and it is often only at the absolute return to health, rather than during the recovery from the operation itself, that the effects of tubercle begin to show themselves. Organic disease produced by drunkenness, and habitual drunkenness, act differently; the organic disease presses heavily at every period, and may destroy life either early or late; but the mere habits of the drunkard show themselves chiefly at a very early period. The patient, who nearly sinks from his unsound organs within the few first days, often lags on for days and weeks in danger; but the man who has simple delirium tremens is taken ill directly, and often

dies, but if he recovers from his delirium he generally gets well from the operation, and sometimes quickly."—P. 101.

The facts now stated are not by any means new. They were well known, and have been well known for one quarter, aye for half a century; for so long, and longer, it may be said, has this state of matters been going forward, in London particularly, and in other large and populous towns. They are, however, well brought forward in the present volume, so far as they are subjects of medical and pathological inquiry. It would be idle to say that we have nothing to do with them in any other point of view. In some respects this is correct; in others it is false. It is quite impossible to know this state of matters, without considering it in all its bearings; its causes; its effects; its relations, social and civil; and above all, the condition of the class of society which are mostly the victims of this mode of existence. Our limits, however, will not allow us here to enter into all these points, which must be reserved for separate consideration. All that we say here is, that all these evils are distinctly traceable to the degraded and pauperized and irregular habits of the working classes in London. Employment is precarious and unsteady, and will not afford them constant and regular meals. Labour is at one time most incessant and urgent, and demands the stimulant aid of the porter-pot and the gin-glass. House-rent is so high, that they are compelled to sleep at the rate of six or eight in one apartment. Window taxes must be paid, and even poor-rates must be contributed; while, by indirect taxation for malt liquor and other articles, so much is consumed, that little or nothing is left for soap, or clothing, or anything that would really contribute to health and comfort. The air these poor creatures breathe, and the light which is admitted into their confined dirty habitations, is in one way or other taxed.

Meanwhile, the attention of the members of government is directed to what is called the sanitary state of the poor and working classes; and well may it be so directed. But it does not occur to government, that they have made the people what they at present are. They have, by taxation and every means of diminishing the comforts of the working classes, and raising the price of the commonest necessities of life, made them greatly worse than the beasts that perish; and now, when they find they are so, they propose to make them better by sanitary measures. A more Utopian idea never entered into the head of any inhabitant of Bedlam. The state to which we have referred, no sanitary measure can ever reach. It is beginning at the wrong end; and after taking much pains to govern ill, it is taking a little more to govern officiously, in order to check or neutralize the bad effects of misgovernment. We must, however, leave this subject at present, with the hope of recurring to it at another opportunity.

Only one other subject can be noticed from this useful volume at present.

Among the disorders to which females are liable, retention of the menstrual discharge is one very troublesome, though sometimes difficult of recognition. The female menstruates and looks well in the face, and otherwise like a woman in whom the uterine function is duly performed. Still the usual quantity of blood is not discharged. She suffers from the ordinary periodical feelings and disorders. The abdomen, especially the hypogastric region, swells; foolish and officious persons shake their heads; and malignant tongues are busy in damaging the patient's character. The patient, indeed, suffers enough of bodily torture without having this of the mind added to it. But this also is her portion, and this she must endure. The cause of all this mischief is various. Sometimes the vagina is obliterated, or its mucous membrane is adherent from inflammation and granulation, at an early period of life. Sometimes a mere membrane blocks up the passage, either immediately below the *os uteri* or a little farther down; and the menstrual secretions of many months are accumulated within the womb. In either case, operation by slitting cautiously the vagina, or puncturing or dividing the membrane, effects an opening, and allows the escape of the retained blood.

The following case is given by Mr Ormerod, and illustrates happily the nature and cause of the disorder.

"A healthy unmarried girl, aged seventeen, was sent up from the country to the hospital for inability to empty her bladder, and was admitted under Mr Lawrence. Till the last few days she had followed her employment as a servant, and, till the present difficulty of passing her water occurred, she had considered herself as well. A catheter was introduced by the house-surgeon into the bladder with great difficulty. The size was only a No. 2 gum catheter, and it seemed to pass vertically upwards, close behind the *os pubis*, through a urethra four or five inches long. The chief impediment seemed to be the narrowing of the urethra by firm pressure from behind forwards. About one pint or more of high-coloured urine was thus drawn off, with great relief to the patient.

"The immediate urgency of her ailments was thus relieved. The following circumstances were made out then and afterwards. The vagina was closed by a membrane at a point situated rather behind the orifice of the urethra, near the situation of the hymen. A firm, apparently solid tumour filled the hollow of the sacrum, and pressed the rectum so much backwards, that the finger could only be passed behind it with difficulty. She had never menstruated, but had never been troubled with much pain in the loins, or bearing down pains, and only occasionally suffered from headach.

"She applied on the Friday: at seven o'clock on the following morning the nurse called the house-surgeon, to say the patient was flooding. The bed contained a quantity of blood, smelling like putrid fish. The blood was still running from the vagina, but the patient was quite calm and comfortable, and showed no signs of loss of blood. The tumour pressing on the rectum was now gone, the



septum had burst, and the finger could be passed through it to a considerable distance without feeling the *os uteri*. She got quite well, and menstruated in one month dating from her admission into the hospital.

"The first suggestion arising to the reader will probably be. Here was a plain case of collection of the menses, and it might have been tapped at once, and the bladder relieved. The fact is this. The woman came late in the day; the prominent symptoms were relieved, no danger existed, and the patient remained in the house for the surgical visit next day. The history of cases often comes from the patient little by little, and until the membrane burst, the house-surgeon, which was myself, had no very clear idea what the absolute cause of the retention was."—Pp. 163-164.

To this case we have little or nothing to add.

We ought to continue our account a little further; but we are prevented by the necessity of attending to other matters. On a subsequent occasion we may return to the volume of Mr Ormerod. Meanwhile, we believe we have said enough to show that it contains matter which will make it an instructive book to all surgical readers. They will find in it much practical information, which deserves not one perusal but several; and they will find facts which will awaken many useful and profitable reflections.

**ART. III.—*Draft of a Bill for the Improvement of the Health of Towns. With abstract of the Speech of Lord Morpeth on Introducing the Bill.***

ON Thursday, the 18th of March 1847, Lord Morpeth, First Commissioner of Land Revenue, and Chief Commissioner of Woods and Forests, announced to the House of Commons his intention to introduce a bill for the improvement of the health of towns, and for effecting various sanitary measures in connection with that object. On Tuesday, the 30th March, his Lordship obtained leave to introduce the bill, explained at the same time the reasons which rendered this measure requisite; and gave a full statement of the condition of the working and poor classes in the large and populous towns.

The main reason was founded on the high mortality of the population of towns compared with that of rural districts; and, above all, the high mortality among the labouring classes of the population. In other respects the reasons were very much the same as those which we have at different times brought forward in this Journal, when noticing the *Registrar-General's Reports*; and, above all, when noticing that of the third quarter of 1846, which was done in our sixty-seventh volume, p. 224.

These reasons it is unnecessary again to recapitulate. We shall merely put down here the numerical statements as given by

the Registrar-General of the mortality of the country generally, with that of several populous towns.

|                           |          |
|---------------------------|----------|
| Mortality in the country, | 1 in 52  |
| London,                   | 1 in 39  |
| Manchester,               | 1 in 30  |
| Liverpool,                | 1 in 29  |
| all England,              | 1 in 45. |

The reason for this will appear presently.

All the world is aware that upon this subject very elaborate and pretty expensive inquiries have been carried on for a series of from six or seven to ten years; and facts which were perfectly well known to many hundreds, we may almost say thousands of persons in London, Liverpool, Manchester, Birmingham, Glasgow, and Edinburgh, have been collected and embodied in various official reports. These facts relate to the degraded, wretched, and helpless condition of the working classes in large towns, the non-working classes, or what may be called waiters-on Providence, the dangerous classes of the French, and the little working, part begging, part thieving classes. The condition of these people, their morals, or rather their total want of morals, the wretchedness and irregularity in which they live, and the misery and helplessness in which they are assailed by disease, and die, were all perfectly well known to many people in the towns, in which these people picked up their precarious and irregular subsistence. It was quite right that the whole of this should be recorded; because it is a rule in England, that no legislative measure should ever be thought of, much less brought forward, without a previous knowledge of facts and necessities.

Upon the condition of this great mass of social corruptibility is the Sanitary or Health of Towns' Bill founded. The author of the bill proposes to improve the health of towns by introducing various measures for draining places requiring drains, furnishing proper and adequate supplies of water, keeping streets and lanes clean and well ventilated, causing the removal of nuisances, and in short doing every thing that may be conceived necessary to provide pure fresh air, plenty of water, and to remove filth from the dwellings of the inhabitants of populous towns.

The measure is recommended by good intentions. But it is totally inadequate to the objects; and not only will it never effect them, but it will be a lasting monument of the folly of legislation on such a subject.

For this opinion several very substantial reasons may be assigned. But we shall advert only to a few, as our limits do not permit us to write a dissertation on this subject.

In the first place, the whole Commission, with Lord Morpeth at their head, are as perfectly at sea on this subject, as ever a ship's company without compass, chronometer, or sextant, were

in their lives. With all their inquiries and all their facts as to the wretchedness, poverty, crowding, confined, and ill-aired dwellings of the working and half-working classes, they have not arrived at the true cause of all this misery and indigence, which lies much nearer the surface than these sagacious persons have been able to see.

They have never yet proposed the question, what makes these poor and hard-working or no-working people live in these places and in this manner? Nothing but absolute necessity, downright grinding poverty, and the entire incapacity to provide either better houses, better beds, better clothing, better or more regular supplies of food. Employment is neither constant nor regular; it is in short precarious; wages are not high, at least not sufficiently so to enable them to pay house-rent, clothing, and food. Then a man may be out of work two or three days in the week; or two or three weeks in the month; and the result is more easily imagined than described. Then all the necessaries of life are high-priced, at least high-priced considering the limited and uncertain means of these poor people. Bread, butter, cheese, eggs, all must be paid for out of their limited means. Animal food they rarely see, except at extraordinary occasions. How is it possible that persons in this situation can either find soap and water to cleanse their persons or clothing, or can afford well-aired houses, or even procure fuel to warm and ventilate them in winter and the cold damp days of spring and autumn? The thing is a mere impossibility, physical, financial, and of every sort.

It is quite unnecessary to go, in order to prove these statements, to the numerical statistics of the question, or to show the revenues and expenses of this class of society. That has been done so often, that we presume every one, even most ignorant on matters of this kind, is aware of the facts.

Now, the natural question is, what has produced, and what is maintaining this wretched state of matters as to the labouring and half-working classes? The answer is, chiefly taxation and its multiplied effects. Soap is taxed; coals in London are taxed; bread and grain have been highly taxed, till within the last twelve months; tea and coffee, almost necessaries to many of these people, are well taxed; the ground on which their houses are built is most highly and exorbitantly priced, often at its longitudinal value in silver; the houses which they occupy are, however wretched and incommensurable, highly rented; the air is taxed; the light is taxed; the water must be paid for in some way or other; and to conclude all properly, the man who works hard, and saves by pinching and sparing, is taxed to maintain his less fortunate or less active companions, within the walls of the workhouse.

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*Magnus ab integro sæclorum nascitur ordo ;  
Jam nova progenies cœlo demittitur alto.  
Te duce, si qua manent sceleris vestigia nostri,  
Irrita perpetua solvent formidine terras.*

The seriousness and sincerity of legislators can often be distinguished and estimated by very small circumstances. Amidst the nebular mist with which all new attempts at legislation, and especially proposed improvements, are involved, it is generally possible to descry some clear and brilliant point, which tells, as accurately as if the legislator's breast was constructed according to the ingenious device of Momus, what are his real intentions. In this case, a very small circumstance occurred which revealed the total extent of the noble legislator's intentions.

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## MEDICAL EDUCATION IN FRANCE.

*Proposition for Reform in Medical Education and Practice in France.* (*Journal des Debats*, 11, 12, et 16 Juin 1847.) — A proposition has been recently introduced into the Chamber of Peers of Paris professing to change and improve the state of the medical profession; and the proposition has given rise to an animated and somewhat lengthened discussion.

The question or proposition was introduced in the form of a *projet de loi*, relating to the practice and the teaching of medicine; and the discussion was commenced on Friday the 11th of June.

It appears that a royal commission had presented a report as to the state of the medical profession in France; and that this report was submitted for adoption by the House. Upon the motion recommending this report to be adopted, M. Cousin made an amendment, which he withdrew; and M. Flourens having made a separate amendment, to this M. Cousin adhered; and they were eventually embodied in the following ten clauses.

1st, The practice of medicine is to be entrusted to two orders of practitioners; licentiates and doctors.

2d, Instruction in medicine is to be given by two orders of schools; secondary schools and the faculties.

3d, The secondary schools to confer the title of licentiate as the faculties.

4th, The faculties alone to confer the title of doctor.

5th, The duration of study for the license to be three years.

6th, The duration of study for the doctorate is to be five years, not including the time for examinations.

7th, The studies pursued in any Faculty of Sciences, and certified by the title of bachelor in the natural sciences, are to shorten by one year the studies to be pursued in a secondary school.

8th, No pupil is to obtain the title of licentiate or of doctor, unless he has practised for one year in an hospital under the eye of a master.

9th, Every doctor and every licentiate may conduct private courses upon the different branches of medicine.

10th, Doctors alone are to be capable of becoming professors or assistant professors, either in secondary schools or in faculties. They alone also can undertake the duty of instruction and service in hospitals.

It is easy to see that the chief object of this amendment was to maintain two orders of medical practitioners; one fully instructed; the other imperfectly educated. It appears that all medical men in France, at least if they wish to be employed by, or under government, are educated on the same model and to the same extent; and those who are not educated on this standard, though often practitioners of much repute and in good employment, owe this rather to natural talents and other causes than to original professional qualifications.

The great object of the amendment brought forward by M. Flourens was to maintain this secondary order of practitioners; whom it was the desire of the government to abolish. There existed an order of medical practitioners called *health officers* (*officiers de santé*.) This institution, M. Flourens contended, was bad, and required amendment. According to some, it was so bad that nothing but extinction could improve it; and accordingly it was proposed to abolish this order entirely. If, however, this order were to be altogether extinguished, then two evils, M. Flourens contended, would result; one, that no provision was made for the medical service of country districts; and the other, that the supremacy of the French medical schools in Europe would be gone.

By confining the object to the improvement of the second or inferior order of practitioners, no harm was done. These men would be raised in the scale of professional accomplishment, and the medical service of

country districts would be ensured ; while they might elevate the studies of the superior order as high as might be thought expedient, not only for the present, while they are superior, but for all time coming.

M. Flourens further contended, that this second order of practitioners had always existed, and always would exist in some form. Previous to 1789, the health officers, corresponding to general practitioners of England, were represented by the Masters in Surgery, all of whom practised medicine, surgery, and pharmacy, as the health officers of the present day. They were, however, better educated.

Though the Chamber were to decide by law to-day, he argued, that all should be doctors, the day after this decision, there would be two orders of doctors ; one, the doctors who prescribe and order ; the other, the doctors who execute, who perform minor surgery.

Having thus proved that a second order is necessary, M. Flourens proposed to call them licentiates, because the old name had somehow fallen into ridicule and contempt.

The amendment of M. Flourens was supported by M. Cousin and M. Bouillet, and strenuously opposed by M. Thenard, M. Wustemberg, the Minister of Public Instruction, the Minister at War, and the Reporter of the Commission.

M. Thenard opposed the amendment, because he doubted whether the second order of practitioners would afford adequate and satisfactory guarantees as to the preservation of the public health. He allowed that the new officers of health proposed by M. Cousin, and the licentiates of M. Flourens, would afford stronger and better assurances than the health officers of the old regime. But this was scarcely the question. Would they afford sufficient and satisfactory guarantees ? This M. Thenard doubted. The pupils trained at the secondary schools could not in three years acquire the knowledge necessary to enable them to practise. They could not be placed on a level with the pupils of the first schools, who did not aspire to the honour of the doctorate till after the period of six or seven years spent in study. Again, if two orders be required, the second would require to possess the degree of Bachelor of Letters. If they do not, how can they understand the Codex ?

It has been an object of apprehension, that without this second order, country districts would be without medical attendants. That this fear is groundless, is shown by the numbers trained to the profession. Physicians are more likely to want patients, M. Thenard thinks, than patients to be without physicians.

M. Cousin stated in reply, that, according to facts furnished him by M. Velpeau, 20,000 physicians, or medical practitioners, were requisite to the medical necessities of France ; and that to supply the chasms annually taking place in this great body, by retirement or death, new doctors were annually required. According to the statement of the Commission, only 357 were required. M. Cousin contended that this number was quite inadequate, and that, under which ever view the matter was considered, 1000 or 800 new practitioners would be annually required, or at the lowest, 600 (696 in exact numbers), to insure the medical service of the towns and the country districts.

The Minister of Public Instruction was, for various reasons, opposed to the amendment. The institution of health officers was a temporary measure, necessary for the exigencies of an extraordinary period in 1811. This necessity no longer exists. The demand to supply annual losses is much overrated by M. Cousin, who makes it reach 700. The necessity for so large a number, he denied on the authority of Chaptal. The mortality of the medical profession in France rests on two hypotheses. According to one, it is 31 per cent. ; according to another, it is 37 per cent. On the first

hypothesis, the annual number required is 476; on the second, it is nearly 500.

For some years past the medical faculties have admitted to the doctor's degree from 500 to 700 persons annually. But the enforcement of the previous possession of the bachelorship of letters lowered the number to 300. Since that period the number has again risen.

This last statement M. Cousin denies on the force of statistical facts. In 1841, the graduations at the three faculties were 421; in 1842, 395; in 1843, 384; in 1844, 381; 1845, 317; and in 1846, 302. This is the increase he sarcastically added. The average of six years is 360.

After some further remarks, the first proposition of the amendment of M. Flourens was put to the vote, and rejected by a large majority.

It is therefore ordered by law that there are not to be two orders of medical men, so far as instruction and training are concerned. There will always, however, be a sufficient number among the whole to undertake the laborious duties of general practitioners. It is the opinion of the French press generally that the Chamber has acted right.

*Honorary Degree conferred by University of New York.*—In our sixty-eighth volume we took occasion to direct attention to the services of Mr Marshall, Deputy Inspector-General of Army Hospitals; and to point out how much was due to those services. We stated at the same time, that we believe that they would not be acknowledged, and that the changes which he suggested would be introduced without any recognition of the source from which the suggestion came. That prediction has been since realized. The limited service enlistment bill, limiting the period to ten years, and assigning a scale of pay according to that and subsequent service, received, on the 31st of March, the sanction of the House of Commons; and the name of its great advocate has never been noticed.

Those, however, who desire to see merit acknowledged, even by conferring empty titles and barren distinctions, will be gratified to learn that the Regents of the University of the State of New York have conferred on Mr Marshall the honorary degree of Doctor in Medicine; and this has been the first case in which that honour has been conferred.

The fact was communicated to Mr Marshall in a letter, dated Albany, 18th May 1847, from Dr Theodore Romeyne Beck, Secretary to the Regents.

"I have now the honour to announce to you that the Regents of the University of the State of New York have been pleased to grant you the honorary degree of Doctor of Medicine. This body has under its supervision all the colleges and academies in the State, and resembles, as nearly as a transatlantic institution can a British one, the senate of the University of London. It has the power of conferring honorary degrees above the rank of A. M. (Master of Arts,) but it has seldom exercised it, except in granting the degree of LL.D. to eminent persons.

"Yours is the first instance in which the honorary degree of M. D. has been conferred on the mere motion of the Regents. They grant the same degree to four individuals every year, on the nomination of the State Medical Society, but these are physicians residing within the State, of mature age and good local reputation."

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Erratum in Vol. lxvii, page 321.

The thermometric minimum at 9 A. M., for November 1844, ought to have been printed Zero.

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PART I.  
ORIGINAL COMMUNICATIONS.

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ART. I.—*On the Ganglionic System of Nerves.* By C. RAD-  
CLYFFE HALL, M. D., M. R. C. S., Eng. &c. Part Fifth,  
with Illustrations.

*The Intervertebral Ganglia: their Comparative Anatomy; Structural Connections; and supposed physiological and pathological relations.*

*Comparative Anatomy.*—Ganglia are found on the posterior roots of the spinal nerves in all Vertebrata. Some difference exists in their proportionate development in the several classes, and has already been noticed.\* The chief peculiarities at present known occur in the fish and in the bird.

In the cod-fish, the posterior root of every spinal nerve consists of two portions. Of these, the one destined to become the dorsal nerve has no connection with the spinal ganglion; the other, which afterwards constitutes the ventral nerve, passes through the ganglion, which indeed exclusively belongs to it. The posterior root, therefore, is only in part, not as in other animals, entirely gangliated.† Still, the gangliated division is by far the largest. The compound dorsal nerve is formed by a branch

\* Edin. Med. and Surg. Journal, October 1846, p. 323.

† Ibid. Vol. lxviii. p. 201, fig. 24. Reference to the plate (vi.) will render the description more intelligible.



from the anterior spinal nerve, which passes between the roots of the posterior nerve just before these coalesce to enter their ganglion, and by the lesser portion of the posterior nerve, which does not enter the ganglion at all. Each dorsal nerve directs its course upwards and inwards towards the mesial line of the back.

The long lateral nerve sent down by the trigeminus and vagus in conjunction, crosses at a right angle each of the dorsal nerves; unites with each, and supplies it with filaments to be distributed to the dorsal fins.

Mr Swan has given a superb illustration of the arrangement of the spinal nerves on emerging from the vertebral canal; but he disallows the existence of a ganglion on any part of the posterior root. "Neither of the branches of the posterior bundle forms a ganglion." (l. c. p. 26.) Professor Owen, on the contrary, states that there is a ganglion, but that it is placed "on the dorsal root of the dorsal branch." (l. c. p. 198.) I believe it to exist as I have above described, viz. on the ventral root of the dorsal branch.

By the non-gangliated spinal nerves from both anterior and posterior roots, the dorsal fins are furnished with spinal power for excitement under impressions, and for movement; by the fifth, with sensational and organic power; by the vagus, with sensational and organic, and perhaps also with motor power. Two obvious inferences suggest themselves. (1.) The ganglia, usually so closely connected with the posterior spinal roots, are not essential to the action of the excitor nerves, otherwise the non-gangliated portion in the cod-fish would seem without a purpose. (2.) Organic activity, usually superintended by one ganglion, may, if circumstances render such an alteration more convenient, be equally well presided over by another. What, then, can be the circumstances which render it more convenient that the dorsal fins of the cod should derive their ganglionic nerves from the trigeminus and vagus, rather than from the spinal nerves? To furnish a reply, we must seek for some adequate difference of arrangement in those fishes, in which this peculiarity of the dorsal nerves does not exist.

In the skate, the whole of the posterior root of every spinal nerve passes through its own intervertebral ganglion, and the dorsal nerves do not connect themselves with the long lateral nerve before they are distributed. The long lateral nerve is formed by the vagus alone, passes underneath the muscles of the back, gives filaments to these in its course, and lies upon and crosses the dorsal nerves from the spinal chord, but does not unite with them. "This nerve," says Mr Swan, "has been carefully examined, but communications between it and the spinal nerves have not been satisfactorily observed." Judging by its supply to the muscles, the long lateral nerve in the skate consists rather of the

motor than of the sensational filaments of the vagus, and it derives no contribution whatever from the fifth.

In the cod, the branchiæ are free and very moveable, and there is a swimming bladder. In the skate, the branchiæ are fixed and immoveable, and there is no swimming bladder. Are not the highly vascular fins of osseous fishes auxiliary lungs?\* just as in the lower crustacea, one set of organs subserves the double office of respiration and locomotion. The gills are the principal organs of respiration; the swimming bladder accessory. Both of these organs receive their largest supply of nerves from the fifth and the vagus. May not the dorsal fins in the cod (? in other osseous fishes also,) derive their sensibility and organic nerve-force from the fifth and the vagus, in order that by these, universally nerves of respiration, they may be associated in their organic actions more closely with the gills and the swimming bladder?

The peculiarity of the intervertebral ganglia in birds consists merely in their greater proximity to the ganglia of the sympathetic in the region of the neck; but their physiological connexion is not greater than in other animals.† The superior cervical ganglion does not possess its usual connexion with the spinal nerves by means of communicating branches; but the trunk of the sympathetic passes down in the canal of the vertebral artery, and is itself connected to each of the cervical nerves as they cross it in its course. A small ganglion is formed at the point of junction, and behind this, but separated from it by the anterior root of the cervical nerve, lies the spinal ganglion. Although the two kinds of ganglia at first appear to be very intimately connected, they are perhaps little if at all more so than in other animals. Their closer relative position may be merely for the purpose of affording a safer lodgment to the sympathetic, which, in the long, thin, flexible neck of the bird, would have been insufficiently protected in its ordinary situation. In the thorax the sympathetic ganglia lie in front of the intercostal spaces; and in order to obviate any dragging, during quick movement of the neck, from the cervical part of the sympathetic being so closely fastened down, each thoracic ganglion is also bound to the walls of the chest by two nerves of intercommunication above and below; one passing before, the other behind each of the ribs.

It does not appear that the actual size of a ganglion is of any greater importance to the white nerve-tubes which pass through it, than as affording a more or less extensive field of action; or that it is regulated by anything more than convenience of arrange-

\* "Humboldt and Provencal have observed tenches to live without apparent suffering, even when their heads and gills were out of the water, and the body alone submerged."—Matteucci's Lectures, *Lancet*, 1847, p. 29, Vol. ii.

† Weber, *Anatomia Comp.* p. 30. Swan, *l. c.* p. 91, Plate xxiii.

ment, in reference to the relative position of the nerves. In the lumbar region of the larger mammals, for example, two ganglia often co-exist in one intervertebral space. This separation, when present, must necessarily preclude such direct harmony of ganglionic action as may occur when the two intervertebral ganglia are united into one, as in man. It would seem comparatively unimportant, as regards the surface of the body, whether its ganglionic centres be a little more or a little less united, sufficient consent of organic action being ensured through the medium of the impressional nerves; hence, in the intervertebral ganglia, these variations of number may be met with. But where a constant and intimate consent is absolutely requisite, the ganglionic centre is never found split up into a plurality of distinct centres; the superior cervical ganglion, for instance, is never otherwise than single in any animal. The gradations presented by the primary ganglia of the fifth and eighth nerves, from the mere tendency to division in man to the complete separation of each into several distinct ganglia in fishes, are in exact accordance with the degree in which the organs supplied require to be directly associated in the performance of their organic processes, or otherwise.

*Structural connections of the intervertebral ganglia.*—Every spinal ganglion is connected by a fasciculus of gray nerve-filaments, with an adjoining sympathetic ganglion. There is, therefore, a direct communication between the two: the cells of the spinal ganglion send tubes which open into the cells of the sympathetic ganglion; but none (or, if any, very few) to open into the cells of the spinal chord. The gray filaments for distribution furnished by the spinal ganglion accompany the white tubes of the impressional nerves which pass through the ganglion, and, as some of these intermingle with muscular nerve-tubes, the gray filaments do so likewise. But the compound cerebro-spinal nerve is joined before its trunk makes its principal division by another fasciculus of gray filaments for distribution, which proceeds direct, through the medium of the *ramus communicans*, from the sympathetic. In this respect, the supply of ganglionic nerves to the extremities, and to the framework of the trunk, only corresponds to the double endowment by ganglionic nerves long recognised in many important parts of the head. Adopting the same rule for conjecture in both cases, we assume, that, as the state of organic activity in the hair-bulbs, and in the areolar and adipose tissues, and in the lymphatic glands, is not modified by the variable condition of the surface, but merely kept in harmony with the rest of the system, and possibly influenced also by muscular contraction, this may be under the exclusive control of the gray filaments which come direct from the sympathetic.\*

On the other hand, the sebaceous follicles, the sweat glands,

\* See concluding paragraph in last paper.

and perhaps the formation of the epithelial cells of the cuticle, are influenced in their organic activity by impressions made upon the surface. We assume it to be the peculiar office of the gray filaments of the spinal ganglia to preside over these.

As every internal organ is endowed with sensibility and spinal impressibility by cerebro-spinal nerve-tubes which have passed through two ganglia, a spinal one first, a sympathetic one afterwards, whence does the *vis nervosa* for organic purposes excited by impressions in the viscera proceed? From the gray cells of the spinal ganglion; of the sympathetic ganglion; or of both? We find that the fifth nerve is distributed in part to mucous membrane without its filaments having passed through any ganglion but the Casserian. The glosso-pharyngeal and vagus also send fibres to the mucous membrane, which have not entered into their fusiform ganglia, and have not therefore any relation to more than the primary spinal ganglia. A spinal ganglion is consequently quite adequate to the purpose of furnishing to a mucous surface all the organic energy required, so long as this has not to be connected with muscular action. When it has, the sympathetic ganglion is invariably superadded. If a sympathetic ganglion can respond to the motor nerve-tubes it transmits (the express purpose, indeed, for which it exists), it can, of course, respond equally to the impressional nerve-tubes which it also transmits. The same impressional nerve-tubes, when passing through their own spinal ganglion, will also react upon the gray cells in that centre. There are therefore two distinct sources in which some of the gray nerve-filaments of the viscera may originate. It does not appear that any object would be gained by the existence of two separate sets of gray cells and nerves for the fulfilment of one and the same purpose. But if we suppose that the cells related to the impressional nerve-tubes from a given viscus in the spinal ganglion are connected by direct continuity of tube with the corresponding cells in the sympathetic ganglion, the two distinct sources become converted into one source, only of greater extent. And, in addition to the increase of nerve-generating tissue thus obtained, it will follow that these cells in the spinal ganglion, when stimulated by the impressional nerves of the skin, which have no direct connection whatever with the sympathetic ganglion, can propagate their excitement to the cells of the sympathetic ganglion, through the medium of the gray nerve-filaments of communication, notwithstanding that the impressional nerves of the internal organ itself are quite unaffected. In this, we perceive a direct mode by which impressions on the skin can react not merely on the intervertebral ganglion, and through this on the organic actions of the exterior; but also on the related sympathetic ganglion, and through this on the organic actions of the interior, although unaccompanied by

any internal sensations to direct our consciousness to what is taking place within. Every instance in which an outward application immediately affects the organic activity of an internal organ, without the intervention of sensation or of spinal action as regards that part, is an illustration of this principle.

We promote bronchial secretion by applying warmth and moisture to the surface of the chest; intestinal secretion in enteritis by fomenting the abdomen; and the uterine and renal excretions by the hip-bath. In these and in similar instances we have exemplified two modes in which the external and the internal surfaces of the body may influence each other in the performance of their organic processes. The sympathy may be ganglionic merely, from excitement of the spinal ganglion being directly conveyed to the sympathetic; or, in addition to this, the spinal nerves may excite the chord, the sensational nerves the brain, and these centres may transmit *their* excitement centrifugally along tubes which pass through the sympathetic ganglion, reacting in it on the organic nerve-cells. Consciousness is the only test as to the nerve-centres which are implicated; and as both spinal and ganglionic action can proceed without our knowledge, it is impossible to decide with certainty in a given case whether the influence of the chord is exercised or not. Still, as the possibility of both kinds of sympathetic action must be admitted, and as the absence of sensation would cause us to exclude the sensational centre from any essential share in producing change in organic activity, so the absence or concomitance of spinal phenomena may, reasoning from analogy, be our guide for admitting or denying, in any instance, the agency of the chord. When extreme pain, for example, causes nausea, flow of saliva, and vomiting, we have evidence that brain, chord, and ganglia are all involved. When improper diet produces strophulus and muscular twitchings during sleep in an infant, there is no evidence of more than chord and ganglia being concerned. And when the tongue is foul from disordered stomach, neither uneasiness of any kind nor derangement of muscular movement being present, there is no evidence that either brain or chord is the medium through which ganglionic action has been modified. But in this last instance we have no proof that the chord may not be slightly implicated, although not to a sufficient extent to induce its own more marked phenomena; we have only no proof that it is. And as it is on the surfaces that excitement generally commences, it will almost invariably happen that sympathy from the communication of this excitement to the ganglia must involve both the centres of the impressional nerves. Life is too short in an amyelencephalous fœtus to permit our testing to demonstration, whether a ganglion without either brain or chord could give rise to organic sympathies. Perhaps the extension of

modified organic action from one molecule to another in the same organ, as in functional excitement during health, and in structural disease of every kind, may be an illustration of purely ganglionic superintendence.

*Physiological and pathological relations.*—We have seen that the relative connections of the intervertebral ganglia are such as to allow impressions made on the skin to affect the organic processes of the exterior directly, and those of the interior indirectly; and on the other hand, reversing the order of action, to allow impressions made on the mucous tracts or in the viscera to react directly on these internal parts, and indirectly on the external parts.

Numerous attempts have been made to discover the exact influence of the spinal ganglia on the capillary circulation by experiments on the web of the frog's foot. The most precise observations are those of Valentin. "The phenomena I have observed in frogs," he writes, "are these.\* (1.) The blood in the capillaries of the web of the frog's foot, previously circulating freely, on stretching the web rather more, (*quodsi membrana natatoria juxta magis extenditur*,) instantly stops. This occurs so readily and so instantaneously, that it can scarcely be ascribed to mere mechanical influence. (2.) After division of the sciatic nerve, and also after division or destruction of the spinal chord, the capillary circulation proceeds uninterruptedly. (3.) When the nerves are divided, the capillaries appear to be scarcely if at all altered in diameter, and respond as usual to mechanical or chemical external stimuli. Still they seem to dilate more readily under slight irritation, so that a larger quantity of blood, especially of blood-globules, enters them, the *stratum parietale* is diminished, and the circulation becomes languid or ceases entirely. (4.) If we divide on one side the posterior roots of the nerves of the lower extremity, and on the other side both the posterior and the anterior roots, the web of each foot presents its capillary circulation unaltered. Still a slighter degree of titillation of the web of that foot which has lost sensibility but not motor power, will cause stoppage or retardation in the capillaries, so that a larger quantity of blood, and especially of blood globules, accumulates. Whereas, in the other foot, which is deprived of both sense and motion, this takes place only after longer titillation or friction, and even then does not supervene until after a greater length of time has elapsed. Hence the motor fibres of the vessels which are connected with the nervous centre appear to react, on applying external irritants, more readily than if they are separated from the nervous centre."

It is obvious that we must deduce the uses of the intervertebral

\* De Funct. Nervor. p. 153, cap. viii. sect. 318. Bernæ, 1839.

ganglia from other data than those supplied by the preceding and similar experiments. The last of Valentin's observations, with his own inference, bears upon the question of the direction in which nervous energy is conveyed. If a nervous centre can be influenced from without only through the medium of a centripetal nerve, how could the integrity of the merely centrifugal nerves of motion cause the vessels to respond to stimulation more readily? How could irritation affect the motor nerves when the impressional ones were destroyed? That the motor nerves were essential is certain, since, when both sensational and motor nerves were cut through, leaving only the gray ganglionic nerves not directly injured, the phenomenon did not result. We are forced to conclude either that every motor nerve contains centripetal fibres of its own, which is neither proved nor probable; or else that a nerve which is admitted to act centrifugally in the ordinary fulfilment of its office, can occasion by its own action a change in the centre from which it proceeds. If a motor nerve by acting centrifugally can so excite a centric change, the impressional nerves may likewise excite their peculiar centric changes in both brain and chord by centrifugal action. Alteration of the existing state of the centric nerve cells, whether recognised by our consciousness or not, whether reaching the mental, or restricted to the physical portions of the nervous system, is all that is essential for the explanation of spinal excitation, cerebral sensation, or emotion, and may be occasioned by the abstraction of force, as intelligibly as by the conduction inwards of certain changes made in the nerve-tubes at their periphery by external stimuli.

Every experimentalist admits that Nature's own illustrations of physiology, when they can be interpreted, are not only more trustworthy, but more simple and intelligible than any which he can evoke by artificial interference. But they are always compound problems. When possible, we seek in experiments to shut out all elements but the one under investigation. If this be impossible, it is still left us mentally to separate the several elements concerned in a given process, to assign to such as are known their established powers, and thus by exclusion to confer on the unknown the office which remains. There are only two modes in which distant parts can affect each other,—circulation and innervation; two general carriers in the economy,—the blood and the nervous force. It generally happens that both modes are in operation at the same time. It is always impossible to ascertain the precise degree in which one modifies the other.

In the intestinal ulceration, and the broncho-pneumonia which supervene after extensive burns, we cannot decide how much of the mischief is due to interrupted cutaneous excretion, throwing more work on the lungs and bowels, and how much to the com-

munication of the great nervous irritation of the surface to the nerve-centres of the viscera. So also of visceral inflammations in the exanthemata; and conversely of chronic skin disease in derangement of the chylopoietic organs. In acute rheumatism how much of the sour perspiration is due to the irritating quality of the blood, how much to stimulation of the impressional nerves from the great morbid action going on at the parts to which they are distributed.

In our attempt, therefore, to assign to the nerves their due share in producing a given sympathetic phenomenon, we have to inquire how much of the result can be ascribed to the circulation without the nerves; all that remains must depend upon nervous influence.

The best examples will be those which, from their very familiarity, are most neglected. In a man of average stature, the perspiratory tubing is estimated as equivalent in length to twenty-eight miles!\* Had the intervertebral ganglia, therefore, no other office besides that of superintending the activity of the sweat-glands, they would scarcely appear to be too extensive a source of ganglionic nerves. In the local change of fulness of the capillaries, and in modified action of the perspiratory apparatus, we find the clearest manifestations of ganglionic reaction. Ordinary sensations arise from impressions which implicate too small a portion of surface, and affect it too slightly, to show any distinct ganglionic action; but such impressions as affect a large portion at once, or a small portion more considerably, do this to an evident extent. Friction and differences of temperature commonly make impressions of this nature.

Warmth induces, first, vascular fulness, and, secondly, perspiration. The first of these effects is undoubtedly due in part to the physical influence of heat in causing expansion of the walls of the vessels and of the contained blood. The increased secretion of sweat may also depend, in some measure, upon the afflux of blood thus occasioned. But not entirely, since where there is no inflammatory action to cause obstruction, hyperæmia of the surface exists in many cases (*e. g.* in blushing) without perspiration. And the sudden and complete checking of perspiration from exposure to cold, before the blood has left the surface, proves that there must be another element in the process. Cold sweats with paleness of surface in collapse; partial sweats from irritation of a subjacent organ; and the instantaneous sweating and the variation in the quality of the excretion under peculiar states of emotion, prove the same.

It seems probable, that every secreting organ (as Mr Bowman has established with respect to the kidney), has a twofold mode of

\* On Healthy Skin.—Erasmus Wilson.



operation ; the elimination of a special product, and the dilution of this by mere transudation of serum. The first being allied to chemical action ; the second to physical exosmosis. Local plethora favours the one ; nervous stimulation the other. The perspiration from exercise or from obstructed lungs is probably more of a mere serous exudation ; that attending many diseases more of a secreted product, from irritation acting on the sweat-glands through the medium of the ganglia. Warmth to the surface then may excite both kinds of perspiratory action ; exudation from fulness of vessels ; secretion from stimulation of the impressional nerves reacting through the intervertebral ganglia. Cold, on the contrary, may check both ; lessening effusion by inducing physical constriction of the blood vessels, and of the sudoriferous ducts ; stopping secretion by deranging the action of the sweat-glands through the medium of the ganglia.

We need not try to explain how one degree of temperature shall excite to greater activity the normal performance of the perspiratory function, another derange it, another completely suspend it. We know not why one degree should produce an agreeable, a second a disagreeable, and a third an absolutely painful sensation. But the facts are so ; and we only assume that differences of heat act similarly on a nerve centre, to which consciousness does not extend (ganglion), to what they do on a nerve centre to which it does extend (sensational centre in the brain). Sensation is not essential. The same effects occur in a sound part when abstraction prevents our noticing them, and in a palsied limb. Hence, although in health, sensation is usually the index of what is taking place, there are other media through which external irritation operates besides the nerves of sensation. The sudden transition from heat to cold not only checks perspiration, but occasionally induces involuntary contraction of the muscles ; as in spasm of the jaw, when swimming against a cold stream, or in more extensive cramp. Here we have evidence that the spinal chord is excited by the impression on the surface. As the spinal excitors and the sensational nerves present precisely the same relation to the cells of the intervertebral ganglia, they doubtless exercise precisely the same reaction upon them. Should the influence of the nerves of sensation therefore be removed, differences of temperature as well as other external stimuli may produce, unnoticed by us, through the medium of the spinal nerves alone, all the reaction on the spinal ganglia, which ordinarily occurs when integrity of the whole nervous apparatus, and our attention to what is going on, cause us to recognise the operation.

Nor is sensation a more certain criterion as to the extent of change induced in the organic actions of internal parts by impressions made upon the skin. A person does not necessarily take cold most easily when he feels most starved.

In every change of an act of secretion, physical and chemical agencies co-operate with the nervous, in producing the effect. Over no secretion, is the power of physical influence more manifest than that of perspiration. When adducing variations in the discharge of this function, therefore, as illustrations of ganglionic reaction, it is not overlooked, nor should it be objected, that a part only of the effect is attributable to the nerves. The conditions of the system which favour copious perspiration are, rapid and feeble circulation, obstructed return of blood from the surface, and a certain amount of excitement of the intervertebral ganglia. A chlorotic girl sweats on slight exertion. The feeble heart readily admits of pulmonic obstruction, general venous plethora, and capillary tension; the poor blood offers no obstacle to the transudation of its thinner part. So also, in every other case of debility with irritation, but without sthenic inflammation; in delirium tremens, chronic bronchitis, influenza. A convalescent sweats readily; so likewise does a corpulent person. In both the heart is feeble and propels the blood with difficulty, when increased muscular exertion obstructs its easy return. A fat person invariably has a weak pulse, and usually a slow one.

Active exercise causes sweating by inducing plethora of the cutaneous capillaries, and partly no doubt by the excitement of the large number of impressional nerves which must be affected being communicated to the spinal ganglia. Here also the feebleness of circulation which succeeds to the actual exercise is more favourable to perspiration than the vigorous and excited action of the heart which attended it. A horse sweats the most *after* his race. Hence, in a weak person, sweating often occurs in the night, when circulation being most languid, the return of blood is obstructed, and by external warmth the surface is predisposed.

The sweating stage of ague, of hectic and other remittent fevers, occurs not until the action of the heart has become weakened, and the irritation of the nervous system lessened. In common fever, when perspiration takes place, the febrile excitement has become diminished. Here, as well as in all visceral inflammations attended with heat and dryness of surface, a general sweat is desirable not so much for the relief it furnishes by the amount of excretion, as for the indication it affords of a lessened degree of irritation in the viscus with which the skin has sympathized. In the thoracic and abdominal affections of children, in Asiatic cholera, and diseases in general attended with collapse, warm moisture on the surface is always the herald of subsiding mischief.

There are many reasons for concluding that a small amount of nervous irritation augments secretion, whilst a greater amount suspends it. The first merely excites the apparatus to greater activity; the second deranges it so that it cannot act. During

the hot stage of fever the suspension of perspiratory action may be due in some measure to direct derangement of the sweat-glands by the abnormal quality of the blood, and by its greater impulse and velocity of flow ; but it is also due in part to indirect derangement through the medium of the nervous centres. Perspiration appears when irritation subsides, notwithstanding the quality of the blood cannot already have undergone any adequate alteration. The hot dry skin which accompanies active and acute inflammations owes its condition partly to the increased force of circulation disordering the sudoriparous glands, partly to nervous irritation imparted to the ganglia. In saccharine diabetes, it is difficult to decide whether the harshness and dryness of skin are not attributable in part to the internal irritation which causes the mal-assimilation, as well as to the actual deficiency of fluid in the blood-vessels.

The pungent heat of surface in erysipelas ; in some forms of fever ; of the chest in sthenic pneumonia ; of the abdomen in enteritis ; arises from great irritation checking secretion, whether that irritation resides in the part itself (as in erysipelas), or in a distant part.

Cold sweats must in all cases be unfavourable. They proceed from weak circulation conjoined with ganglionic irritation, and organic force too low in degree to produce animal heat. They indicate irritation without power. The irritation generally consists in the disorder induced by shock ; in the production of which a deficient supply of blood seems to play an important part. When large doses of tartar-emetic are administered prior to the reduction of a dislocated hip, as soon as the heart becomes sufficiently enfeebled, and the muscular strength in general sufficiently prostrate, a cold sweat bursts forth. When bloodletting is carried to syncope, the same occurs. Doubtless a similar increase of secretion takes place in the mucous tracts and in the viscera at the same instant.

The comparison of epilepsy with syncope points out that feeble circulation promotes, and forcible circulation prevents, perspiration. And in cardiac diseases we have exemplified all the conditions most favourable to profuse sweating. Whether obstructive or otherwise, in reference to a given cavity of the organ, every disease of the heart is obstructive to the circulation at large. There are venous plethora to distend the capillaries, frequent pulse to irritate, excitable nervous centres prone to disordered action, and deficiency of tone in the skin as well as in the other soft textures,\*

\* Is there anything more than elasticity in the areolar tissue of the glandular viscera, and in their ligaments? On opening the abdomen of an animal just killed, and stretching and twisting the lobes of its liver, they resume their place and recoil after stretching, and settle down slowly to their natural position, in a manner that almost suggests the existence of contractility.

—all favouring cutaneous excretion ; whilst there is usually no inflammatory excitement to oppose it. In every form of heart-disease, sweating is induced by very slight exertion.

In phthisis, also, many circumstances concur in predisposing the skin to perspire readily. To deficient tonicity of the soft parts, we must add irritability of the nervous centres, rapidity of circulation with feeble impulse, and obstructed passage through the lungs. The marked night-sweats of the latter stages, however, have probably a special exciting cause in the nocturnal exacerbation of hectic which precedes them. So long as the general irritation of system induced by the evening change, here morbid in its degree, is sufficiently great, it excites the sweat-glands to the extent of suppressing their secretion, and induces a hot and dry state of the skin. As the general excitement lowers, the secreting organs and the nervous centres together become less and less stimulated, until the degree of excitement at length amounts merely to that of a stimulus to action. The commencing secretion of the skin is now promoted by the very heat of surface which the previously checked action of the sweat-glands had allowed to accumulate.

The same series of changes may occur in intermittents, and to some extent in every febrile paroxysm where distinct stages present themselves. The fever-poison depresses the powers of the entire system. Vital manifestations are low (cold stage). During the suppression of functional exercise in the cold stage, force gradually accumulates, at length masters the depressing agency, acts violently, and suppresses secretion (hot stage). Lessened by its expenditure, it gradually attains the degree which permits of secretion, and excites it (sweating stage).

On the principle that every living molecule—nerve-cell and other—has a tendency to accumulate force, (*aliis verbis*, to become more fitted for exercising its peculiar properties,) when its normal exercise is suspended or obstructed, after a time to discharge that force, and, by so doing, to restore vital actions to their equilibrium, may be explained the all-powerful influence of the *vis medicatrix nature*.

Any irritation of the ganglia, which induces general disorder of the organic processes, will manifest its influence most where ganglionic nerves are most abundant. Heat of skin is frequently more evident on the palms of the hands and soles of the feet, than on other parts of the surface. Partial sweating likewise is more common here than elsewhere. The increased heat is ascribed by Dr C. B. Williams to the physical obstacle to transpiration offered by the unusual thickness and hardness of the cuticle.\* This, however, appears to be scarcely the whole explanation. If the obstacle to

\* Library of Medicine, Vol. iii. p. 171.

perspiration caused the proneness to heat, it could not cause the proneness to sweating. And the cheeks, with their fine, thin cuticle, usually burn in irritative fever at the same time with the palms and the soles. All these parts agree in being largely supplied with nerves. Sensational and spinal excitor nerves abound. In all probability, ganglionic grey nerves do so likewise. Assuming the irritation to act on the skin through the medium of the organic nerves, the cheeks, palms, and soles are precisely the parts in which we should expect to find the greatest amount of disordered organic action, (coldness, heat, or sweating.)

The variation in the colour of the skin, and in both the colour and the rapidity of growth of hair and other epidermoid textures, occasioned in all animals by alteration in the temperature to which they are habitually exposed, may be due in part to reaction through the ganglionic nerves.

Unless with the exception of partial sweats, it is not proved that the ganglia are at all concerned in the foregoing examples of modified perspiratory function. It is only extremely probable. But to explain the influence of emotion on the skin, the intervention of the nervous system becomes absolutely necessary. And there are some points in therapeutics which are unintelligible without it. That blood-letting, tartar-emetic, or other nauseants, might promote diaphoresis, when that has been checked by over-impulsion of over-rich blood, in virtue of their influence on the force of the heart, and on the constitution of the circulating fluid, is easy to be understood. But that a dose of opium, which controls sweating from exhaustion, and fails to promote it when checked by inflammatory excitement with plethora, shall induce perspiration as soon as irritation alone constitutes the chief cause of obstruction, is not quite so easily explained. Opium acts beneficially, by allaying irritation; and what is allaying irritation, but a lessening of that disordered action of the nervous centres, the ganglia amongst the rest, which keeps up derangement of every function in the economy? When irritation depends upon deficient power, as it often does, any kind of general stimulant will act in a similar way. When the surface is chilled, brandy promotes perspiration. When the system is enfeebled, as by prolonged exercise in hot weather, brandy checks profuse perspiration. Warm diluents taken into the stomach have a marked influence in producing or maintaining perspiration. These well-known facts are inexplicable without admitting the intervention of organic nerves, and if so, of the intervertebral ganglia.

As the sympathetic response of the skin to the stomach establishes the fact that excitement of the visceral nerves may extend to the nerves of the exterior, we cannot refuse to admit the same sympathy reversed. An impression on the skin which causes

ganglionic reaction on the sudoriparous glands, may at the same time cause reaction through the ganglia of the sympathetic on any of the internal organs. If this be true, we have an exact index in the obvious condition of the surface, to the concealed state as regards secretion of the viscera. When by any means we have induced a uniform genial perspiration, we shall have also induced at the same time, and by the same means, a uniform genial secreting action in the different viscera, and more especially in the mucous lining. A warm, soft, perspiring skin, and a dry, brown tongue, never co-exist.

It is a collateral deduction from the same law, that the phenomenon of checked, or, on the contrary, of increased secretion, manifest on the surface as the result of the same remedy under difference of circumstance, is precisely similar, though less open to observation, in internal organs. If secretion is checked in consequence of strong excitement of the circulation, opium, considered as the type of its class, increases the evil. But if it is checked by that deranged mode of action of the nervous centres termed irritation having disordered the secreting apparatus, opium re-establishes secretion. If for the word secretion we substitute disordered nutrition, and for that, again, inflammatory action, the same remark holds good. Whatever the concomitant state of strength or debility, of general over-action or general under-action, inflammation is pre-eminently *disordered* nutritive action; and its cure consists essentially in *restoration to order*, whether by lowering action, or by increasing it. To advocate large and repeated doses of opium, without depletion, as correct antiphlogistic treatment for the strong and robust, is as bad in theory as in practice. In constitutions broken down by the permanent deficiency of all that should maintain health, as in the wealthy debauchée, or poverty-stricken artisan, acute inflammation resembles the stronger and healthier form in little more than the name. In them the omission of blood-letting, and the exhibition of opium from the commencement, may be as beneficial as we generally find it in the pseudo-inflammations of the puerperal state after flooding. In every disease the question of practice is simply an inquiry into the cause of the symptoms. Does inflammation in a given case depend more upon vascular over-action, or more upon irritation, *i. e.* disorder of the nervous centres? In almost every case, at different periods, each element predominates. In almost every case, at different stages, depletion and opium are required. We have not the two elements separate and distinct. There cannot be excitement of circulation without secondary excitement of nervous centre; there cannot be irritation of nervous centre without secondary modification of the circulation. The question is not, therefore, which exists, but which prevails.

Considering the necessary implication and operation of the gan-

glia in all deviations from the normal performance of nutritive actions, this brief allusion to inflammation and irritation is strictly relevant. We are all guided in practice by our theoretical notions upon them. It is desirable to submit our ideas to the test of expression.

Additional arguments are furnished by the phenomena of cutaneous reaction. Cold applied without intermission produces numbness; it incapacitates the sensational nerves from feeling correctly, and the motor nerves from acting vigorously. A certain degree of warmth,—and temperature being relative, more precise language is useless, appears necessary to nervous action; to touch and muscular contraction, and even to mental exercise in perfection. Nature admirably ensures this requisite, by connecting the inherent development of heat with every act of expenditure of force, whether nervous, muscular, or organic. Continued cold, severe in degree, depresses the power of the brain and of the chord, inducing stupor and immobility, and at length death. We have here evidence sufficient that it acts as a powerful sedative on the peripheral nerves, and on two great nervous centres. We assume that the third kind of centre is not exempt from the same influence; that severe cold will lessen ganglionic excitement, as we know that it will cerebral or spinal.

On the other hand, we learn from experience that the temporary application of cold, or its continued application when there is great inflammatory excitement and extreme development of animal heat, acts as a stimulant on the nervous centres, inducing reaction which may spend itself on the sweat-glands, causing free perspiration, or, if prevented by inflammatory disturbance from exciting secretion, may increase the local excitement which already exists.

Whether it be that the power of cold to impede conduction in the nerve-tubes enables its temporary application to suppress the expenditure of *vis nervosa*, and thus to permit of an accumulation, which, when the obstruction is removed, will tend to discharge itself with unusual energy; or, whether the alteration in the physical condition of the peripheral nerves, of their capillaries, and of their blood, is the efficient cause of their subsequent excitement; the fact is indisputable, that the temporary application of cold acts as a stimulant to the part. The stimulated impressional nerves communicate their activity to the intervertebral ganglia, occasioning local flush and glow; to the chord, inducing increased muscular tone and activity; to the sensorium, causing a sense of warmth and of comfort. Directly through spinal and sympathetic ganglia and gray nerves; indirectly through chord, brain, and white nerves, the excitement of the impressional nerves of the skin affects internal organs.

The bracing effect on the general system, the improved digestion, increased activity of bowels, and energetic discharge of various other functions which result from the outward application of cold, illustrate the communication of stimulus from without to within. The glow on the entire surface after drinking a cold draught exemplifies the reverse.

Reaction is in all cases a nervous action, and the extent to which it is manifested furnishes one of the best tests of the amount of vigour in the nervous centres. Depression of mind chills; hilarity warms. In the former, the nervous centres to a slight degree suffering from shock, respond languidly to the stimulus of the atmosphere at an ordinary temperature; reaction is slight; and the sensation of cold being inverse to the reaction, chilliness is felt. The coolness which really exists from diminished organic activity, however, is usually not so considerable as the person's own feelings dictate. That peculiar state of nerve-cells which is induced by shock gives rise of itself to a sensation of chilliness, either partial or general, which is far too instantaneous in its accession to depend on actual loss, or deficient production of animal heat. Every one must have observed the sudden rush of coldness through the entire body on slipping and recovering without injury. In a comparatively low temperature, under the excitement of fixed attention or of exhilarating occupation, the active nervous centres respond with energy, and by promoting organic action maintain a grateful warmth. Hence, the immunity of exposure under circumstances which stimulate the nervous system; and the danger of taking cold when the nervous system is exhausted, or has its energy depressed.

The rationale of the use of hot and cold applications is founded chiefly on that of reaction, external and internal. Experience teaches that heat at a high degree acts as an irritant; at a medium degree (warmth,) as a sedative; at a low degree (cold,) as either an irritant or a sedative, according to circumstances.

The increased heat developed in a part actively inflamed must, by expanding the molecules fluid and solid, distend the tissues and dilate the capillary vessels, and by so acting add to the evil in which itself originated. The less the heat evolved, the less active the inflammatory process. Cold applications which abstract heat should, therefore, be proper in all cases of active external inflammation. On physical grounds they would be. On physiological grounds they are not. When we excite reaction of the surface we stimulate the skin. If the skin be already suffering from over-excitement, any additional stimulation must prove injurious. In the first stage of erysipelas, of acute orchitis, or of synovitis, there is already over-activity of the organic processes; and cold applications are found to increase the heat and the pain.



If intermittingly applied, they are especially injurious, by admitting of a succession of reactions during the intervals. When, indeed, a stimulating effect is desired, as in old rheumatic or strumous affections of the joints, the occasional and temporary application of cold is of service. But when inflammation is proceeding with great activity, the organic changes are too energetic to succumb to the sedative influence of cold, and continue despite its constant and perfect application. Unless employed to such an extent as to endanger the life of the inflamed part, cold under such circumstances is always mischievous from the reaction it excites.

In internal affections we are guided in the employment of cold by the same rule. The cold douche is an admirable stimulant in hysteric eclampsia, congestion of the brain, narcotic poisoning, in typhus with diminished heat, in torpor of the mucous tracts, and in other cases where an extensive stimulus of the nervous centres is required, and when there exists sufficient vigour to ensure the reaction which is at once the sign and the effect of the stimulation. When inflammation is subacute, and the danger of reaction proving hurtful is less, and when inflammation is of a purely local character, as in that from external violence, the risk of employing cold is of course diminished. But in constitutional inflammation, as erysipelas, gout, acute rheumatism, cold applications can never be desirable, unless in the rare instances in which an actual stimulus is necessary to augment the too languid local action.

The beneficial effect of cold affusion in scarlet fever may appear to contradict these remarks. There is already over-action of the entire surface, and in proportion to the amount of this as indicated by the heat of the skin, is cold affusion useful. The sensation of burning heat and dryness in itself is a great source of irritation and exhaustion to the brain; and the same action of the nerves which occasions this is doubtless equally irritating to the chord and ganglia, producing restlessness through the first, and suppressed perspiration through the second. The pleasantness of the application declares that the nerves of sensation have undergone a desirable change; the composure and quiet, the coolness and slight perspiration on the surface prove in like manner that this change extends to the chord and ganglia. The reaction exhausts itself in the secretion of the sweat glands, which is now promoted by lowering the irritation which had kept up its suspension. Perspiration is here suppressed partly from direct excitement of the cutaneous circulation, partly from irritation of the nervous centres increasing the disorder of the secreting apparatus. Cold affusion lessens at once the vascular fulness, and lowers the excitement of the nervous system; it takes away for the time the causes which have prevented secretion, and secretion ensues.

Acting in the diametrically opposite modes of a stimulant and

a sedative, the outward application of cold needs great discrimination. The employment of warmth demands less. An application hot enough to cause pain is a stimulant ; but mere warmth never excites to an injurious extent. Its physical effect is to relax the tissues ; its vital one to soothe the nerves. When secretion has been suppressed by capillary tension and ganglionic irritation, the tendency of warmth is to relieve both these conditions and to promote secretion. When no excitement exists, continued warmth still favours secretion and lessens tone. Hence the debilitating influence of a hot climate, or of apartments constantly overheated. Increased secretion, diminished muscular and nervous energy, added to the relative deficiency of oxygen in the inspired air, occasion lassitude, feebleness, and undue excitability. Imperfect aëration of blood, languid action of the heart, congestion, or vicarious excitement of lungs, liver, or kidneys, ensue in natural order.

In all local inflammations, warmth and moisture to the surface are found beneficial. They hasten the subsidence of the irritation which maintains inflammatory disorder ; they promote suppuration where it is inevitable ; they tend to prevent it if the inflammation has not already given rise to effusion that must become puriform. In acute conjunctivitis, otitis, toothach, gout, erysipelas, paronychia, orchitis, anthrax, irritable ulcer, inflamed mamma, and other painful affections, which may be placed immediately under the influence of local remedies, the feelings of the patient dictate warm in preference to cold applications ; and they dictate correctly. Sensation is nature's monitor not merely of what is agreeable, but of what is beneficial. Pain results from disordered action of a nerve of sensation. Whatever causes pain generally disorders equally the non-sentient nerves of the pained part. Relief of pain consists in removing for the time the disordered action of the nerve of sensation on which pain depends. Whatever relieves pain lessens equally existing disorder in the non-sentient nerves of the affected part. Hence the degree of pain is the criterion of the state not merely of the sensational, but probably of all the nerves in an organ suffering from disease ; and did inflammatory action or chronic disorder of nutrition depend solely or principally upon nervous interference, it would be a criterion, which it is not, of the actual state of disease itself. It indicates this so far as the nerves are concerned, but no farther. When, therefore, general irritation is kept up by some indefinable disordered action of the nerves, the treatment most agreeable to the sensations, *i. e.* that most desired by the patient, is usually the treatment best adapted to allay the constitutional irritation. Hence the importance of yielding to the instinctive wishes of the patient when not decidedly

improper in matters of hygiene, and the great value of anodynes whether moral or medicinal.

In visceral affections, warm applications to the skin are by no means so inert as is sometimes supposed.\* The use of the warm bath is universal. From neglecting to estimate the augmented sensibility of surface, in such cases as puerperal peritonitis, for instance, an ordinary warm bath has occasionally proved virtually a hot one, and acted injuriously as a stimulant. Sponging with tepid water in fever will sometimes convert a hot dry skin into a merely warm and moist one. The usefulness of warm moist air in acute thoracic inflammations arises as much from the effect produced on the skin as on the pulmonic surface.

The impressional nerves of an internal organ usually arise at the same point as those of the superjacent integument. From the intercommunication of spinal and sympathetic ganglia being nearly on the same transverse level, the ganglionic nerves of the skin and of the viscus beneath virtually arise together also. An outward application, which produces an agreeable sensation, affects at once the centric origin of all the related nerves. Hence pleasant warmth of the surface of the chest indicates a favourable condition not merely of the nerves of the skin, but likewise of all internal parts closely related to that portion of integument, viz. the lining membrane of the air passages. In like manner, in other parts of the system, community of action between exterior and interior (sympathy) is often due to community of origin in the nerves supplying both. The diminution of restlessness and of other signs of spinal excitement which generally results from promoting the organic actions of the skin, as it also frequently does from restoring an internal secretion, may, at first, seem to imply the existence of a direct connection by means of gray nerves between the chord and its intervertebral ganglia; allowing the ganglia to draw off and use (so to speak) the superfluous *vis nervosa* which is exciting the spinal centre. But when we recollect that the excitor nerves of the chord are themselves always implicated in the disorder which has checked secretion, and must therefore participate in any alteration of the ganglionic nerves which permits secretion to be re-established, the argument is invalid. On the other hand, if such direct communication did exist, we should expect that irritation of the brain or chord, in which the distributed ganglionic nerves are not primarily involved, would be manifestly relieved by inducing ganglionic action. Yet profuse sweating artificially excited affords no relief to a paroxysm of mania, an attack of tic, or to a fit of epilepsy. Nor does it seem that the copious lacrymation so common in centric neuralgia of the forehead in any degree allays the pain.

\* In relieving irritation of the intestinal mucous tract, this is peculiarly evident.

Connected with ganglionic reaction on the surface, is the rationale of counter-irritation. According to the principles laid down, irritation of the skin will produce in the order stated the following effects. (1.) Excitement of the impressional nerves of the skin; (2.) of the intervertebral ganglia, and of the organic nerves of the part; (3.) of the sympathetic ganglia directly connected with the intervertebral ones, and consequently of the organic nerves of related internal parts; (4.) of the chord, through the medium of the spinal portion of the cutaneous nerves; (5.) of the brain, through the medium of the sensational portion of the cutaneous nerves. And when to the irritation succeeds discharge, we have also the remedial operation of local depletion, and of artificially excited secretion.

Blisters may be taken as the type of their class. As they always stimulate in the first instance, their employment is contraindicated whenever ganglionic action is already over-excited. But when excitement has been lowered, a blister will produce its local effect without causing injurious reaction; and if ganglionic action is deficient as well as disordered, the stimulation itself becomes of service. The point requiring discrimination, therefore, is, whether in a given case the excitement will be more injurious than the discharge beneficial; or, on the contrary, when stimulation is wanted, whether the subsequent loss of fluid and continued irritation will not, by the debility they induce, more than counterbalance the immediate good of the stimulation. We need a guide to the existing state of ganglionic activity; and we have an infallible one in the heat of the surface. When the skin is hot and dry, the ganglia are already over-acting, and blisters will but increase the excitement. They are inadmissible in the active stage of all inflammations; in all fevers whilst there is increase of animal heat. Destructive inflammation of the knee-joint has frequently resulted from applying a large blister during the acute stage of synovitis. Acute bronchitis has been changed to extensive broncho-pneumonia; febrile delirium into stupor with contracted pupils, by similar maltreatment. It is when inflammatory excitement is merging in morbid secretion, when the nervous centres have spent their surplus of energy, and all the processes are less actively deranged, that blisters become serviceable. In the bronchitis of children, a blister at the proper time will sometimes in a few hours remove entirely the mucous rale and quick panting respiration, and with these the blueness of face, the play of the *alæ nasi*, and extreme anxiety of expression. At an earlier stage, the same remedy would prove fatal, and often does. The nervous centres in infancy are excitable and weak; excited readily and exhausted rapidly. The management of infantile diseases depends on distinguishing between the two conditions. Here,

also, animal heat is our guide. In every acute disease we have both states presented, and generally in rapid succession. Inflammation, with heat of surface, needs depletion; with general coldness, requires stimuli.

In headach of every kind, whether attending fever or otherwise, if it require local treatment at all, the question between depletion and counter-irritation is to be decided by the amount of heat of surface. With heat, the former; without heat, the latter remedy proves most useful.

In chronic effusion after pleurisy, peritonitis, or synovial inflammation, the drain of fluid from the gorged capillaries themselves, and the excitement of new ganglionic action by the local irritation, are both important. The common phrase of "stimulating the absorbents" by means of blistering, friction, the inunction of mercury, iodine, &c., is perhaps an erroneous expression of the *modus operandi* of such remedies in hastening the removal of solid or fluid morbid products. When inflammation has given rise to these, its active stage is over. Unless it be so, the class of remedies referred to is not merely useless, but injurious. They act beneficially by stimulating the nerves, and through them the ganglia; exciting through the medium of the ganglionic nerves a more active performance of the molecular changes of nutrition in the sluggish tissues which immediately surround the morbid deposits. These deposits, when solid, not being fully or at all organised, when once removed, are not replaced.\*

There is an additional mode in which a permanent artificial drain may influence disease in deep-seated organs. The process of secretion set up on the surface is a source of perpetual irritation to the impressional nerves, and through them makes a constant demand upon the ganglia. The deranging ganglionic action hitherto directed to the diseased part is now expended on the external sore; relieving the disease to the extent to which its interference had previously been prejudicial. Thus "one fire puts out another's burning." Nature illustrates the same principle when she affords relief to an overtaxed organ by exciting another to extraordinary activity.

By an issue we maintain artificially an unusual susceptibility of the nerves of the part, in virtue of which they would seem to attract to themselves the effects of any undue irritation in the nervous centres. This assumption is necessary to explain the ordinary phenomena of taking cold. It is immaterial to what part of the surface cold is applied, if disordered action result, it invariably

\* A gentleman had a chronic enlargement of the bursa over the patella, the consequence of a blow. In size it equalled a small orange. Declining to have the tumour punctured, he applied for himself a strong ointment of sulphuric acid. The burning pain he described as being very severe. In a fortnight all swelling was gone, no discharge whatever having occurred.

falls on an enfeebled part. In one person, wet feet will induce catarrh; in another tonsillitis, or bronchitis, pleurisy, or diarrhoea. The organ which from original or acquired susceptibility is predisposed, is the part to suffer. The exciting cause—cold—at first affects the whole of the nervous system, producing more or less disorder for the moment in all the ganglionic centres. The weakest part alone remains disordered. Its nerves may be considered permanently to possess the extra-liability to derangement, which we create wilfully when we establish an artificial secretion.

Hitherto we have endeavoured to illustrate the manner in which the action of the intervertebral ganglia may be elicited through the medium of the cutaneous nerves, by impressions made at their peripheral terminations. We assume that these ganglia respond in a similar way to irritation existing in the other nervous centres, when conveyed to them by the impressional nerves from within. We cannot otherwise explain the power of emotion to induce horripilation or sweating; pallor or blushing; local heat or coldness. Urticaria from irritation of the stomach; papulæ from dentition; the change in a healing wound from derangement of the digestive organs; the recession of an eruption from over-purgation; are so many examples in which the intervertebral ganglia are influenced from within. In palsy, if any difference of temperature of the skin exists, the paralysed limb is usually the coolest. The limb being unused, the stimulus of volition absent, the reaction between the impressional nerves and the cutaneous ganglia wanting, nutrition proceeds less actively than in the fellow limb. Nutrition languishes not because the palsy has deprived the limb of any element necessary to the perfect performance of nutritive action, but merely because the functions of the different parts are no longer actively exercised. In consequence of this deficiency of energy in the processes of nutrition, a palsied limb possesses less power of withstanding injury, or of repairing its effects. It is scalded or burnt, becomes inflamed or ecchymosed, ulcerated or mortified, far more readily than a sound limb. The nerves of impression being paralysed, can no longer excite through the ganglia conservative reaction. There is no sudden perspiration to throw off excess of heat; no sudden activity of nutrition to prevent the occurrence of inflammation; no immediate change in the capillaries to prevent the transudation of blood. Languid nutrition being unfavourable to change, wounds, ulcers, or œdema in a palsied extremity are tedious and troublesome. Any deteriorating agent diffused throughout the system interfering with nutritive action first where that action is already the weakest, in hemiplegia we have instances of mercury affecting only the palsied half of the mouth, and of jaundice colouring only the palsied half of the body.

By these facts we are compelled to admit, that although the nervous centres furnish nothing which is indispensable to the mere performance of nutrition, yet to the perfect and continued performance of healthy nutrition, the reactions through the nerves, in the highest animals at least, constitute an essential stimulus.

Besides the preceding effects, which result from the absence of the influence which the brain and chord normally exercise over the ganglia, there are other phenomena occasionally presented in palsy, which can only be attributed to this influence morbidly exercised. Such, for example, is actual increase of temperature on the palsied side. Mr Caesar Hawkins has recorded several cases in which this fact was noted with great accuracy. In these cases we assume that the cause of paralysis, whatever its nature, keeps up constant irritation of the centre in which it resides, and through the nerves which proceed therefrom induces excited action of the ganglia, and rapid performance of nutritive change. From theory we might expect in these cases either emaciation or inflammatory œdema of the palsied parts, subjective sensations of a painful or of a peculiar character, and involuntary twitchings. I am ignorant how far the expectation is realized by observation.

By assuming that centric irritation of either brain or chord, through the medium of the impressional nerves, can excite and derange ganglionic action, we can explain why sloughing of the eyeball occurs in some cases of anæsthesia of the fifth nerve, and not in others. If the cause of disease keeps up constant irritation at the root of the disabled fifth nerve, it indirectly keeps up constant irritation in the ganglion, constant interference with nutrition, and thence inflammation and its consequences. If, on the other hand, the loss of sensibility arises from mere compression of the nerve, or of its source, as there is no irritation, nutrition proceeds uninterruptedly. So also in palsy from injured spine, the kidneys are usually deranged in their action; whilst in spinal palsy from disease they suffer less frequently. A fractured vertebra, or inflammation of the *theca vertebralis* from a blow, will keep up morbid action of the chord, and through its nerves, of the ganglia. Chronic disease more generally abolishes the function of the chord, without maintaining constant irritation.

Such cases as the subjoined perhaps receive an explanation from, as they certainly furnish an illustration of, the intimate relation existing between the impressional and the organic nerves of the skin.\* Habitual irritation of the impressional nerves (from cold

\* "A healthy man, aged 46, who had been troubled from his youth with profuse perspiration of the feet, had suffered for two years past from frequent pains in the limbs, which were worst towards night, were evidently of a rheumatic character, and had followed his getting cold and wet in the feet. The perspirations at last were suddenly suppressed, and immediately after the patient experienced a feeling of weakness and loss of sensibility in the lower extremities. At first, these phenomena were confined to the leg, but extended subsequently to the thigh

and moisture) caused suppressed perspiration by deranging the intervertebral ganglia. If this disorder, by affecting the capillary circulation, induced tension of the ganglion, which, from the dense unyielding nature of the capsule of the ganglion, it might do, the transmitted nerve-tubes of impression would suffer, perhaps would sustain compression. Loss of sensibility, but not of motion, would result. The morbid influence here acts in a circle. The impressional nerves derange the ganglia; the ganglia in turn derange the impressional nerves. Remedial measures that would relieve either effect, would relieve both. Pediluvia, for example, if efficient at all, would allay irritation in the peripheral nerves, both impressional and ganglionic, and would consequently act beneficially on the ganglia in a twofold manner.

The degree to which the spinal centre was implicated appears to have been indicated by the degree of interference with muscular power. Any different view of the pathology of these cases is hardly reconcileable with the speedy efficacy of the very simple remedies employed.

In estimating the mode in which the organic nerves are affected by any cause of general disorder, the direct influence of varied tension of the capillaries, and of varied rapidity of the circulation in the substance of the ganglion itself must be borne in mind. Lobstein has given accurate representations (coloured) of the vascular endowments of the superior cervical ganglion, (Plate iv. figs. 1, 2, 3, 4, and 5); and pointed out the following particulars: A ganglion derives its vessels from the arteries and veins in its vicinity; on the outer envelope a network of minute vessels is formed by the free anastomosis of the twigs supplied; this exterior capsule being removed, a second network of much finer vessels invests the substance of the ganglion. "This at first sight appears like a red pulp, but viewed through the microscope is found to consist of innumerable twigs, which pursue *the same direction as the filaments of the ganglion themselves*, and amongst

and lower abdomen, and were accompanied by enuresis and constipation. Totally unable to walk, he was able to move about on crutches, dragging the lower half of his body after him; but when seated he could move his legs in any direction. *Perspiration was limited to the upper half of his body, ending just below the umbilicus.* The lower half was dry, and desquamated continually. Sexual power was lost. The most careful exploration of the spinal column was instituted, but nothing could be discovered to account for the paraplegia. Dr Romberg then conceived, that the suppression of the habitual perspiration from the feet at least indicated the therapeia in the case, and he prescribed the foot-bath, with half an ounce of "aqua regia," (nitro-muriatic acid,) thrice a-week. In a fortnight the gait became steadier, the patient was able to stand, the feet, hitherto cold and dry, became warm and moist. From one-third of a grain to one-half of a grain of the spirituous extract of nux vomica was then administered, and in fourteen days the urinary bladder recovered its tone, and sensation returned to the lower extremities. After a few months' perseverance in the treatment, the patient recovered perfectly, except a slight tottering in his gait."—*British and Foreign Medical Review for July 1847*, p. 43.



which is interspersed some of the '*materies tomentoso-globulosa*,' (i. e. ganglionic cells.) It is probable, moreover, that every packet of nerve-fibres (or every filament? '*singula stamina nervosa*') is accompanied by its arteriole and venule, just as we observe in the larger branches of the nerves. Hence proceeds, without a doubt, (?) the red colour proper to every ganglion."\*

Whilst the minute branches from the arterioles run longitudinally; those from the venules cross the ganglion transversely.

By this extreme minuteness and subdivision of its vessels, the ganglion is protected against vascular disorder under every slight derangement of the circulatory system, but it will, nevertheless, participate like other nervous centres in the disturbance occasioned by considerable or long-continued interference with the action of the heart. The effect of this influence will, however, under ordinary circumstances, be to increase the ganglionic derangement previously or concurrently induced by the gangliated cerebro-spinal nerves, whether that disorder tend to excite or to depress ganglionic activity.

Mr Swan is of opinion that the circulation in a ganglion is affected through the medium of the arteries by vascular excitement of the part it supplies.† For instance, I presume, as the arterioles of the semilunar ganglia are derived from the same source (the coeliac axis,) as the vessels of the stomach, at the same time that the presence of stimulating food excites the latter, will it render the former more active in their circulation.

By some writers the spinal ganglia have been considered to be the principal seat of the affection termed "Spinal Irritation;"‡ of which, notwithstanding, the exact nature has been left unexplained. In the absence of exact physiology, precision in pathological induction is impossible. Authors on Spinal Irritation have, therefore, abstained from giving even a definition of their term, and usually left their readers to discover of the facts presented what are essential and what accessory. The concurrence of tenderness over any portion of the vertebral column with functional derangement elsewhere, appears sufficient to constitute a case of spinal irritation.

If in its ordinary action the spinal centre is involved in many instances of *normal* sympathy without implicating the brain, and therefore without any attendant sensation, it is highly probable that it may occasionally become so unduly excited as to induce *morbid* sympathy without causing pain. In this case we should have irritation of the spinal chord without morbid sensibility over the affected portion. Convulsions from teething, laryngismus from disordered stomach, chorea from loaded colon, indeed the greater

\* Loco cit., p. 68.

† On the Brain and other Centres, p. 23; and on the Sympathetic Nerve, pp. 15, and 46.

‡ Teale on Neuralgic Affections, 1829.

number of disorders from deranged "reflex function" are examples of spinal irritation without spinal tenderness.

Again, vertebral tenderness occurs without any symptoms to prove that the chord itself is excited; without any abnormal acts of movement. A gouty patient suffering from gravel will often complain if pressure be applied over the lower dorsal vertebra; yet in the absence of derangement of the functions of the chord, of which sensibility is not one, we cannot assume that spinal irritation exists. The name, therefore, is bad, since the condition which it signifies, over-excitability of the spinal centre, may exist without the characteristic of tenderness on pressure; and on the other hand, this tenderness may be present when there is no concomitant irritation of the chord. The term "spinal tenderness" might generally be substituted.

We are not, however, to conclude, because irritation of the chord does not invariably accompany spinal tenderness, that it never does. In many cases we have undoubted evidence of the contrary. Physiology is our only guide. Of the signs enumerated as frequently presented, hiccup, palpitation, spasmodic dyspnoea, trismus, convulsion, trembling, and impaired muscular power, are spinal symptoms. Neuralgic pains, muscae, night or day-blindness, tinnitus, deafness, impairment of smell or taste, undue sensibility or numbness of skin, nausea, unnatural conditions of hunger and thirst, and of sense of temperature, being all of them sensations, must be referred to irritation of the sensational centre, and are cerebral symptoms. Pyrosis, diarrhoea, or diuresis, indicate disordered action of the visceral ganglia. Local sweats, eruptions, or altered vascular fulness of the skin, disordered action of the cutaneous (*i. e.* intervertebral) ganglia.

If one or several symptoms of each class co-exist, we have a right to infer disordered action of all the nervous centres. If one kind of symptoms alone be presented, we have no right to assume disorder of any other centre than the one to which the symptoms belong. Tenderness on pressure depending on undue sensibility, is an attribute of the sensational centre, and of itself merely implies derangement there. The question, therefore, resolves itself into this: Is spinal tenderness always accompanied by some essential pathological condition which invests it with additional significance?

It appears to be one of the laws of sensation, that its degree of acuteness depends chiefly upon the condition of the peripheral terminations of the sensational nerves, in respect both to natural organisation and acquired susceptibility. "Irritation on the internal branch of a nerve, by disorder of function in the viscera, will be felt or attributed to the external branch of the same nerve."\*

We will suppose that the same nerve sends off two branches;

\* Sir C. Bell's *Practical Essays*.

one to A, where its terminal filaments are organized for obtuse sensation only; another to B, where the distributed filaments are fitted for acute sensation. The same impression made at A, and at B, when conveyed to the common centre, will not give rise to two similar and equal sensations. Moreover, as one nerve-tube, when stimulated, has a tendency to impart its activity to others which arise in company with it; or, in other words, as a given nerve-cell, when excited by one tube, sends force along the other tubes which depart from it, and likewise extends its state of excitement to the cells immediately around it; it may happen that an impression made on A, which is too slight to cause distinct sensation of any kind in that organ, may manifest itself by sensation in the more sensitive part B, notwithstanding that this is only secondarily affected. This is referable to perception; but the same holds good with respect to subjective sensations. When the brain is irritable, our abnormal sensations are referred to the most sensitive parts;—to the skin, or to the organs of special sense. In disease, we may consider any viscus to be represented by A; the related portion in external surface by B. How constantly is irritation of the stomach declared by frontal pain; in the liver by shoulder-ach; in the heart by uneasiness in the arm; in the bladder by pain at the external orifice of the urethra; in the hip-joint by pain at the knee; in the ovary by pain in any part! Aching across the loins attends disorder of liver, intestines, kidneys, bladder, uterus, ovaries, or testes; and, in all but acute affections, may constitute the greatest amount of the pain experienced. What is more common than for a patient to be quite ignorant of existing derangement of his liver, and to complain of his supposed rheumatic or neuralgic pains elsewhere? There was no pain, yet on pressure over the liver, often over its left lobe, there is considerable tenderness. The irritation was not sufficient to excite of itself the sensational nerves of the obtuse gland, but quite sufficient when its effect on the sensational centre had involved the origin of the related nerves of the skin to excite them, because at their distribution they are more sentient. This view requires the theory of centrifugal action of the nerves of sensation. When by pressure we do excite pain in the liver, we have added to the existing irritation, and in so far altered the peripheral filaments of the sensational nerves of the organ, to an extent which rouses the sensorium to recognise what is taking place. The final cause of this arrangement, permitting important viscera to perform their office under trifling degrees of irritation, without themselves becoming painful, whilst our attention is still attracted to the occurrence by uneasiness in the less important outworks, is quite obvious. It enables us to distinguish the degree and thereby to estimate the danger of internal disorder.

In an enlarged view, we might consider the centre of sensation as one main trunk, from which all the sensational nerves in the body proceed, and which, if sufficiently excited, might evoke the peculiar power of any or every nerve of sensation. The general hyperæsthesia in hysteria may probably be thus explained. Why the organs of generation should be capable of influencing the centre of sensation more extensively than others? needs no remark. In general, an internal organ has a special relation to some particular portion of the external surface, and will first react upon this in preference to the remainder. This especial relation may be due to a simply mechanical cause, respecting the arrangement of nerve-cells, in which the sensational tubes originate. The nerve-tubes which arise together are ordinarily packed up together, and separate only when about to proceed to their distribution. Assuming that the sensational nerves of the liver, and those which supply the skin of the scapular regions, emerge from the spinal chord at the same place, and severally pass on to their different destinations, in all probability their cells of origin in the brain lie close to each other; if so, irritation affecting either set of nerves will extend to both, and be most noticed in the most sensitive.\* Taken alone, therefore, spinal tenderness indicates not spinal irritation, but cerebral irritation; or, if the term be preferred, disorder of the sensational centre. Even if constant pain be superadded, the inference from this symptom only will be merely, that the disorder is of higher intensity. Nor does the efficacy of remedial agents applied to the seat of pain prove anything more, since *à fortiori* from the premises, if irritation of A produces excitement in B, relieving this secondary excitement of B may fairly be expected to tend to allay the primary irritation in A.

But experience teaches, in respect to other parts, that persistent tenderness on pressure is usually allied with more or less structural alteration in the painful organ. Such tenderness of the spine would therefore reasonably bear a similar import, provided we could prove that the tenderness *was of the chord itself or its appendages*. From experience also we learn, that spinal tenderness is, in one case, transient, and altogether unimportant, curable by any treatment, or requiring none; in another, unintermitting, attended with the gravest symptoms, and defying every conceivable mode of treatment. The two kinds of case may be classed, as they have been, under the same head of spinal irritation. The designation and the pain may be all they have in common.

\* This is merely an extension to the nerves of sensation of Mr Mayo's idea concerning the reciprocity between sensational and motor nerves. "Nerves of motion take their rise from the same region or segment with those sentient nerves which transmit the impressions, by which their action is usually regulated."—Physiology, 3d edit. p. 267.

In most cases, it is far easier to decide what the precise pathological condition which attends spinal tenderness is not than what it is. Reasoning on diseases of the nervous centres has been greatly vitiated by a constant tendency to ascribe all their symptoms to some modification of vascular pressure. The occurrence of very similar general symptoms from excess of blood, and from its deficiency, is sufficient to declare, that the proximate cause is neither over-compression nor under-compression, but a *tertium quid* common to both. As regards tension of vessels, if 2 represent the amount best suited to healthy action of nerve-cell, lowering the amount to 1, is theoretically as likely to derange the nerve-cell as raising it to 3. Either will produce disordered action; and, to disordered action of the dynamic portion of the nervous centres, whether occasioned by compression, as in apoplexy, by concussion, as in injury, by alcohol, as in *delirium tremens*, by want of blood, as in hemorrhage, by checked circulation, as in syncope, by the effect of poisons, as the typhus, woorara, or prussic acid—whatever be the accompanying condition of the blood-vessels, must the symptoms be referred. Whatever is adequate to induce such disordered action in the nerve-cells is sufficient to occasion the symptoms.

The pathological condition in spinal irritation has been variously ascribed to hyperæmia of the chord, inflammation of its membranes, variations in the quantity of the liquor of the chord, congestion of the veins, and, most vaguely of all, to effusion undetermined in seat! It has been justly objected that any one of these conditions, of such at least as are possible, would lead to more serious results, and be attended with more urgent symptoms than those most usually presented by the cases in question. On the other hand, the frequency with which marked relief is afforded by local depletion, or derivation over the tender part of the spine, leads us to suspect that there is really some disorder in the small blood-vessels. In an ordinary case, this vascular disorder cannot be to the extent of inflammation of the substance of the chord; the symptoms, the course, and the termination conspire to negative that. The absence of valves in the large sinuses, and their very free inosculation, render venous congestion improbable. Gravitation would prevent local compression from excess of the liquor of the chord; and the symptoms do not indicate pressure, but excited action.

Bearing in mind the extreme vascularity of the *pia mater*; the luxuriance of its supply of organic nerves; the mode in which it sends into the chord for a short depth its innumerable, fine, longitudinal septa; and the superficial position (as I believe) of the strands of common sensation; may we not reasonably conjecture that an afflux of blood—active determination without inflam-

mation—may sometimes be induced in the spinal *pia mater*? May not the irritated nerves of impression from any disordered viscus, by reacting on the ganglia through which they pass, cause excitement of the gray nerves of the *pia mater*, and altered vascularity? Until it be determined whether the sympathetic or the spinal ganglia supply these organic nerves, we have no ground for conjecture how far one or other kind of centre must necessarily be implicated.

It is not imagined that even this comparatively small change of action in the capillaries exists in every case of so-styled spinal irritation, but merely that it may do so in those instances in which, from the symptoms and from the effects of remedies, we can scarcely doubt the existence of disordered vascular action of some kind. The curability in one case; the unchecked progression to structural lesion of the chord, with abolition of its functions, in another, would in this way be readily explained.

In some instances we observe phenomena intelligible only on the assumption that the intervertebral ganglia are implicated. The following is a case of this description:—A delicate, unmarried lady, aged 34, not subject to hysteria, has for seven or eight years suffered from occasional attacks of hiccough and vomiting. An attack is brought on by any general derangement of the system; by catarrh; autumnal diarrhoea; or even by over-fatigue. Formerly the retching and hiccough would continue for many days, until extreme exhaustion ensued. Various remedies were tried from time to time by different medical attendants, but with small advantage. At length attention was paid to the state of the spine. Over the lower half of the cervical region the skin was found to be hot; and on pressing the spinous processes, tenderness and a sensation of weight were experienced. A few leeches, followed by a small blister to this part, entirely removed the distressing symptoms. Attacks continue to recur occasionally,—on the average three or four times a-year; so that frequent opportunities have been afforded of verifying the observation. On one of these occasions, the attention of the patient was attracted by a sensation of tingling to the skin over the upper part of the sternum, which was found to present a reddened circular patch, slightly tender on pressure; in size equal to a crown-piece. The attacks which have since occurred have always been accompanied by this red patch, which ceases with the subsidence of the internal symptoms, and is not observed at any other time. In the earlier seizures, large blisters over the entire epigastrium had been frequently employed without relief to the hiccough and vomiting; latterly, a blister the size of a half-crown over the lower cervical vertebræ had succeeded invariably in removing these symptoms, as soon as vesication was fairly established. Until a free secretion commenced, the blister aggravated the symptoms. Reasoning on this, the indication

seemed obviously to set up an artificial secretion in the part, as free from accompanying irritation as possible,—to employ derivation, not counter-irritation. A small seton was introduced, and kept in for several months. During the period of its use, no attack was experienced; the month following its withdrawal an attack supervened.

Can we explain the occurrence of the hiccough and vomiting, conjoined with cervical tenderness, the absence of all signs of primary affection of the abdominal viscera, and the effects of treatment, in any other way so well as by presuming that there exists at the origin of the phrenic and vagus nerves, some morbid state (hyperæmia of the spinal *pia mater*), producing irritation, *i. e.* disordered action, in these nerves? And can we account for the sternal patch of redness, unless we admit that some such cause of irritation, by implicating the impressional nerves of the skin which arise in the same part, extends its influence through them to the intervertebral ganglia, and thence through gray organic nerves to the capillaries?

A well-marked case of hysteria, physiologically interpreted, presents us with an explanation of the pathology of all cases of spinal irritation in which structural alteration of the chord or its appendages has not taken place. The menstrual nixus, voluptuous emotion, the irritation from loaded intestines, &c., occasion excitement and disorder in the ovaries and uterus. From our ignorance of the precise nature of this disorder, it is common to assert that we must be ignorant of the nature of hysteria, *i. e.* of the phenomena to which this unascertained kind of abnormal action gives rise. This is at least a gross *non-sequitur*. The impressional nerves of the ovaries excite the chord, inducing spasm and movement; palpitation of the heart and irregularity of breathing; constriction of the throat, and rolling of the intestines; excite the brain, inducing perverted moral feeling and misdirected volition; heightened sensibility and morbid sensations; excite the ganglia through which they pass, and, secondarily, other ganglia, through the intervention of the brain and the chord, occasioning tears, flow of saliva, secretion of flatus, diarrhœa, or copious micturition. There may be more tenderness at the portion of spine which corresponds to the origin of the irritated spinal nerves than elsewhere; because, as already assumed, the allied nerves of sensation of the skin and the viscera emerge from the chord together. And although there is universal sensitiveness, there may be a greater degree of this in the portion of skin supplied by nerves related to the original focus of irritation.

If such a concatenation of conditions occurred and terminated suddenly, and were of short duration, the case would be denominated hysteria. If greatly prolonged in duration, and somewhat

less marked in intensity, the case would be considered one of spinal irritation. In both instances, we have nothing to warrant the inference that more than functional disturbance of the nervous centres exists. That more may occasionally supervene is in accordance with the analogy of disorder leading on to disease in other organs; but when it does so, additional pathological conditions declare it.

If energy of healthy nutrition and activity of function invariably correspond; if we never find the maximum of functional power with the minimum of nutritive change; if, in short, the functional action of an organ and its nutrition depend upon the same process; what we call mere functional disorder will still imply derangement of structure, how slight and transient soever. It may be that this derangement consists in nothing more than unusual rapidity, or unusual tardiness of molecular change; but whatever its nature, there must be disordered performance of the process of nutrition for the time being. The disorder, as it does not lead to the formation of new products, is temporary and comparatively innocent; but if constantly recurring, it will render the organ more prone to that increased and vitiated disorder of nutrition which leads to cognizable change of structure. By assuming, therefore, that in many cases of "spinal irritation," the nervous centres are not structurally affected, it is intended to signify that the nerve-cells are only so far affected as to be deranged in action for the time, and not so far as to induce persistent change of structure.

In the slighter cases which have been reported under the title in question, we conclude that there has usually been mere functional disorder of one, or of all the nervous centres, occasioning, through the medium of their respective nerves, the phenomena referred to different organs; that in the severer cases, morbid change of structure may have ensued in either ganglia, chord, or brain, or in all; and may have existed in every degree of intensity, from simple congestion of capillaries to inflammation and its consequences; and, therefore, that the term "spinal irritation" has been employed with too great latitude and want of precision.

In reference to the spinal ganglia, it follows that they may or may not, as declared by the symptoms, play an important part in producing the phenomena of a given case of spinal irritation.

A summary of the assumed physiological relations of the intervertebral ganglia is contained in the following postulates.

1. Any external impression which affects the cutaneous nerves to a sufficient extent, affects also the ganglia through which these nerves pass on their way to the spinal chord.

2. The reaction may manifest itself in some modification of the organic processes, superintended by these ganglia only. And



as the ganglionic and the impressional nerves are distributed together, the point of impression and the point of organic reaction will correspond.

3. Or, the excitement of the spinal ganglion may spread through the direct grey nerve of communication to a given sympathetic ganglion, and from this again to several, occasioning change in the organic actions of internal parts.

4. Through the impressional nerve-tubes which terminate in the chord, spinal excitement may extend itself to other spinal nerves besides those first stimulated, and induce every variety of spinal phenomena, and influence, through their respective ganglia, the organic actions of any or every organ in the body, without necessarily causing sensation.

5. Through the nerve-tubes which terminate in the brain, similar results may ensue, sensation and other psychical states being superadded.

6. In a similar direct and indirect method, impressions commencing in the internal parts may affect the intervertebral ganglia, and through them the organic processes of the skin; with or without the accompaniment of sensation.

7. The state of organic activity in the interior and on the exterior will therefore greatly correspond, permitting us to infer the unseen from the seen.

8. There being no good foundation for the eclecticism in the action of remedies on the different nervous centres, which some have imagined, if remedies affect alike, *cæteris paribus*, the grey cell, whether in brain, chord, or ganglion, (the different organization of related parts considered), the above remark (7.) will be available in therapeutics. We may infer from the effect on the skin, the effect on the viscera, and perceive the rationale of curing external by removing internal irritation.

9. The intervertebral ganglia being independent centres, disease of the brain, or chord, of such a kind as not to occasion and maintain irritation of the cerebro-spinal nerves, but merely to suspend their function, will interfere with the performance of the organic processes of the skin, negatively only, by ceasing to stimulate.

10. But disease of such a kind as to keep up perpetual irritation of the cerebro-spinal nerves, will excite and maintain disordered action of the ganglia; a positive interference which may lead to every form of disordered nutrition and its results.

*Holmes Chapel, Cheshire, July 20th 1847.*

#### *Description of Plates X. XI.*

##### PLATE X.

Fig. 28. Diagram intended to illustrate the structural relations of the

pinal and sympathetic ganglia to each other, and to the chord and encephalon. The cerebral and spinal nerve-tubes are represented as large cylinders; the ganglionic, as shaded and smaller tubes. No grey filaments are placed amongst the white fibres in the roots of the spinal nerves; their non-existence, however, in this situation may not be generally admitted by anatomists.

*a. a.* Volitional, or cerebral motor tube entering the sphere of the grey matter of the chord; not related to any ganglion.

*b. b. b. b.* Sensational or cerebral excitor tubes, not entering the sphere of the grey matter of the chord, but always related to that of the spinal ganglion, and occasionally passing through one or several sympathetic ganglia also.

*c. c. c. c.* Spinal excitor tubes.

*d. d. d. d.* Spinal motor tubes.

*A. R.* Anterior roots of compound cerebro-spinal nerve

*P. R.* Posterior roots of do.

*R. C. R. C.* *Rami communicantes.* The peripheral portion of the grey filaments which proceed from the sympathetic ganglion to be distributed along with the cerebro-spinal nerve, is represented as forming a constituent of that *ramus communicans* which joins the motor spinal root only. This may or may not be the ordinary arrangement. It is so figured here merely for the sake of distinctness. All that we have actually ascertained, is the fact that a fasciculus of grey sympathetic filaments keeps its course onward to the spinal ganglion; whilst another fasciculus bends aside to accompany the distributed cerebro-spinal nerve.

Fig. 29 represents a fusiform ganglion which was found on the *chorda tympani* of a dog.

1. Otic ganglion.

2. Motor portion of fifth nerve joining the infra-maxillary division.

3. Inferior dental nerve.

4. *Chorda tympani*, possessing in this instance a fusiform ganglion; connected posteriorly by separate filaments with the *ramus auricularis nervi vagi* (6.), and with the inferior fusiform ganglion on the facial nerve (7.) Anteriorly, a filament is sent up along the inferior dental nerve (3.), whilst the other and larger portion pursues its usual course in connection with the gustatory nerve (8.)

5. Infra-maxillary branch of fifth nerve.

6. *Ramus auricularis* of the vagus.

7. Facial nerve.

8. Gustatory branch of fifth.

Fig. 30 represents two unusual fusiform ganglia found in a cat. One is placed on the *ramus auricularis* formed by the combined filaments of the glosso-pharyngeal and vagus; the other on the communicating branch between the facial and the glosso-pharyngeal, external to the cranium.

1. *Chorda tympani*.

2. Fusiform ganglion on the *ramus auricularis nervi vagi*, at the point where that is joined by a filament from the *ganglion petrosum* of the glosso-pharyngeal.

3. Fusiform ganglion on the nerve-arch which connects the facial with the glosso-pharyngeal nerve, lies beneath the mastoid process, and furnishes some filaments to the posterior belly of the digastric muscle.

4. *Ramus tympanicus*, formed by the conjunction of a larger portion from the *ganglion petrosum* of the glosso-pharyngeal with filaments from the auricular branch of the vagus.

5. Stapedius muscle. Introduced to show its close relation to the fa-

cial nerve in the Fallopian canal. It is so firmly connected to the sheath of the nerve, that it might be mistaken for some appendage belonging to the *portio dura*, on dissecting the parts after they have become bleached by immersion in alcohol, or hardened by the use of acid.

6. Lower fusiform ganglion on the facial nerve.

7. Facial nerve.

8. Eighth nerve.

a. Glosso-pharyngeal nerve.

b. *Par vagum*.

c. Spinal accessory.

#### PLATE XI.

Fig. 31. Diagram of the general connections of the encephalic ganglia, intended to represent the mode in which the sympathetic communicates with each; and that in which each of the different nerves of sensation communicates with several ganglia.

1. Superior cervical ganglion of the sympathetic placed in front of the inferior ganglion of the vagus.

2. Spheno-palatine ganglion.

3. Ophthalmic ganglion.

4. Submaxillary ganglion. A packet of filaments are seen directing themselves, in company with the gustatory nerve, towards the situation of the sublingual salivary gland.

5. Infra-maxillary division of fifth nerve.

6. Otic ganglion.

7. Seventh pair of nerves.

a. *Portio mollis*.

b. *Portio intermedia*.

c. *Portio dura*; with its two fusiform ganglia.

8. Eighth pair of nerves.

a. Glosso-pharyngeal; with its anterior motor root passing the spinal or superior ganglion before joining the rest.

b. The vagus.

c. The spinal-accessory; of which the higher portion constitutes the motor root to the vagus.

9. Ninth nerve.

10. *Ramus auricularis* of the vagus, receiving a small contribution from the *ganglion petrosum* of the glosso-pharyngeal, and proceeding to the inferior fusiform ganglion on the facial nerve.

11. Extra-cranial connection between the facial and the glosso-pharyngeal.

12. Superior Vidian nerve; great superficial petrosal; or, cranial branch of the pterygoid. It proceeds from the superior fusiform ganglion of the facial nerve to the spheno-palatine ganglion. The inferior Vidian is seen descending into the carotic canal to join the sympathetic.

13. Grey contribution from the sympathetic (carotic plexus) to join the superior fusiform ganglion of the facial.

14. Little petrosal of Longet, (figured also but not described by J. F. Meckel); proceeding from superior fusiform ganglion of facial to Otic ganglion.

15. Little superficial petrosal of Arnold; coming from the tympanic plexus, and through it from the glosso-pharyngeal nerve; proceeding in company with 14, to the otic ganglion.

16. Filament from the tympanic plexus, (and through it from the glosso-pharyngeal and vagus), to the superior fusiform ganglion of the facial nerve.

17. *Ramus anastomoticus* of Jacobson, or more properly of Andersch;

formed principally by the glosso-pharyngeal, which it leaves at the *ganglion petrosum*, and alightly by a contribution from the auricular branch of the vagus.

18. Grey twigs from the carotic plexus of the sympathetic to the tympanic plexus.

\* *Plexus tympanicus*.

19. *Chorda tympani*.

C. N. Two highest cervical nerves.

*Erratum*.—In Plate VIII. Fig. 26, a superficial band of filaments from the nates on each side is represented as joining a rootlet of the third nerve. This is wrong; the filaments become lost in the *crus cerebri*, close to the origin of the third nerve, but do not connect themselves, as would be inferred from the engraving.

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ART. II.—*Observations illustrating the Anatomical Structure and Physiological History of Monsters with Eventration*. By CHARLES HENRY HALLETT, Demonstrator of Anatomy in the University of Edinburgh.

IT is generally admitted by physiologists that investigations into the structural peculiarities of monsters by defect, redundance, or excess, are replete with interest not only in a teratological but also in a physiological point of view; that the acquisition and careful comparison of the facts which are to be obtained from such investigations lead not only to the establishment of principles or laws appertaining to, and regulating the production of the various aberrations of nature, but also afford happy confirmation of the correctness of the views at present entertained respecting the development of the embryo.

To advance the science of teratology, and to determine its exact relations to natural science in general, it is necessary that every instance of malformation, whether slight or grave, should be accurately described even in its minutest details. The reason why teratology has not advanced so rapidly as many other branches of science is, as I shall have occasion to point out more fully hereafter, not from the want of materials, which are sufficiently abundant for every purpose, but from the want of accurate information on some points in the anatomy of monsters, which, although they may appear trivial and unworthy of notice to the casual observer, are nevertheless of the utmost importance for arriving at any satisfactory conclusions, or for deducing inferences respecting their nature and cause, which will bear the tests of time and observation. This remark appertains more especially to the numerous group of monsters with eventration which I intend to consider in this notice.

Three cases of monstrosity with eventration, for which I am in-

debted to the kindness of Professors Simpson and Allen Thomson of this university, have come under my own observation, and have been dissected by me within the last two years. These cases, with others which have been carefully described and figured by recent observers, will enable me to point out the general features in the organization of these monsters, and to show the existing state of our knowledge of their history.

Case I. A full-grown male foetus, the head of which appeared perfectly formed, had a large membranous sac depending from the left side of the abdomen, in which the intestines, the liver, and other viscera were clearly discernible.

The sac, one of the most interesting structures connected with the organization of the monster, was entire, and enclosed the protruding viscera. It was firmly fixed by lymph to the liver and to the intestines, the convolutions of which it embraced closely. Its circumference, which encircled what might be appropriately termed the neck of the eventration, was attached to the abdominal parietes and to the umbilical cord. In most parts of its surface it was translucent and thin; but in others, especially over and in the immediate vicinity of the viscera, to which it was adherent, it was opaque, whitish, and had become much thickened, in consequence of a considerable amount of plastic lymph having been deposited within its substance. Careful dissection proved it to consist of three layers or membranes, superimposed on, yet distinct from each other, except where the lymph had been deposited, and had matted and united them into one firm and consistent mass. The external layer or membrane was continuous with the theca of the cord at the umbilicus, and, throughout the rest of its extent, with the common integument of the abdomen. It did not pass at once and abruptly into the skin, but a faint reddish-white line, about an eighth of an inch in breadth, indicated that the textures of the one and of the other were blended insensibly, and transmuted for a short distance. This layer was evidently the amnion. The second or middle layer was readily separated from the external around the circumference or neck of the sac, in consequence of the whole thickness of the abdominal parietes intervening between them. It passed behind and lined the walls of the abdominal cavity, and was thereby recognized as the parietal layer of the peritoneum. The internal layer, from its anatomical relations to the liver, stomach, and intestines, was discovered to be the visceral layer of the peritoneum, and to have been constituted principally of the greater omentum. It was most distinct at the lower part of the sac, and probably would not have entered into its formation had it not been intimately blended with the middle layer in many different places.

These membranes were each submitted to a microscopical ex-

amination, by which it was discovered that they had the same structure, that the external as well as the other two membranes possessed the germinal membrane and tessellate epithelium, characteristic of a serous membrane.

The sac having been divided crucially, and carefully reflected from the viscera, to which it was adherent, an aperture or rather a fissure in the abdominal parietes was brought into view. The inner side of this fissure was nearly straight, but the outer was curved; the convexity of the curve looking towards the left side. The fissure extended from the sternum to near the pubes; its length was nearly five inches; its breadth, even at the widest part, scarcely exceeded an inch.

All the abdominal viscera were displaced and thrown out, some partially, others completely—from the abdomen, and were all more or less misshapen.

The liver was thrown out of the abdominal cavity most completely. It rested on both the abdominal and thoracic parietes, and was placed obliquely on them, so that one surface looked upwards and to the right, the other downwards and to the left. It ascended as high as the lower border of the fourth rib, on the left side, and descended as far as the umbilicus on the right. Instead of having its usual flattened form, it had assumed that of a compressed sphere, in which the right and the left lobes could not be distinguished. There was a depression of inconsiderable extent on its right inferior border, through which the umbilical vein entered directly into its substance. Another depression was observed on the opposite border, which lodged the gall-bladder in a collapsed state. A large and rounded portion, thicker anteriorly than posteriorly, projected from its lateral and posterior aspect, which, on close examination, was found to be the *lobus spigelii*, enormously developed. A sulcus, more than an inch in depth, intervened between this lobe and the general mass of the organ.

The œsophagus was slightly increased in length, and opened into the stomach on the left side of the *lobus spigelii*. The stomach was greatly displaced, but not much altered in shape. It was received into the sulcus between, and was closely compressed by, the *lobus spigelii* and the body of the liver, in the substance of which it appeared to be completely imbedded, before some adhesions between the sac and that viscus were divided and the parts more completely exposed. The lesser curvature looked directly backwards, and tightly embraced the posterior constricted portion of the *lobus spigelii*. The greater curvature projected somewhat from the surface of the liver, and was all that could be seen of the stomach, unless the two parts of the liver were forcibly separated. The stomach appeared to have been lodged in the extraordinary and unlooked-for position I have just

described, by the *lobus spigelii* pushing both it and the gastro-hepatic omentum forwards and upwards, during an unusual increase in its size and development.

The intestines were drawn together and puckered, in a very peculiar manner, by thickening and extensive contraction of the mesentery and mesocolon—the result of inflammatory action. They were greatly distended with air and meconium. No appreciable difference in the structure and general appearance of the intestines could be detected throughout their whole extent. The existence of a short unsacculated cæcum, the position of a small and short *appendix vermiformis*, together with a slight increase in the calibre of the gut, indicated the place of termination of the ilium, and the commencement of the colon. The cæcum and ascending colon were placed over but external to the left lumbar region. The rest of the gut was intermixed with the other viscera without any exact arrangement. The rectum was very much enlarged, and was distended with air; it passed through the fissure, coursed downwards through the pelvis on the right side of the bladder, and terminated at the anus, which was more anterior than usual. Numerous intussusceptions were observed especially in the jejunum and the ileum.

The spleen, much compressed and somewhat globular in form, was bound tightly to the cardiac extremity of the stomach, and placed in the front of the eventration. The hilus, properly so called, did not exist. Numerous large vessels ramified over its surface; many of these were collapsed, and these simulating depressions gave the organ a constricted or lobulated appearance.

The pancreas embraced the posterior surface of the constricted portion of the enlarged *lobus spigelii*. The splenic extremity was so much flattened out and expanded by the pressure of the liver on it, that it surpassed the duodenal extremity in breadth.

The left kidney had a somewhat pyramidal form, and rested on the abdominal parietes behind the intestinal canal and the spleen. The renal artery entered, and the renal vein and ureter emerged from its inferior and internal border. The right kidney had been only partially displaced, one part, the lower border, remaining in, and the other part, the superior border, projecting out of the abdominal cavity.

The left supra-renal capsule presented a constriction a little below its middle, which divided it into two unequal portions, the greater of which was above. The right supra-renal capsule was normal in every respect.

The right ureter passed into the pelvis in immediate contact with and on the right side of the aorta. The left descended into the pelvis parallel to the last turn of the intestine, which was situated behind the other viscera.

The testes still remained in relation with the kidneys on each side. The left was attached to some convolutions of the gut by adhesions contracted between these parts and the sac. The right was partially invested by a duplicature of the peritoneum. The *gubernaculum testis* could not be detected on either side, hence probably the reason why the testes, especially the right, to the descent of which no mechanical obstruction was opposed, still constituted a part of the contents of the sac at a period we might naturally have expected to have found them in or near the inguinal canal, if not in the scrotum.

The fundus of the bladder projected slightly from the pelvis into the sac, to the lower part of which it was adherent. The structure and appearance of the pelvic organs generally were normal.

The course and relations of the larger blood-vessels were peculiar and well worthy of notice. The abdominal aorta had been drawn considerably to the left of the median line, by the continued traction and weight of the eventrated viscera. On the right side, it was in immediate relation with the right ureter, and on the left side with the *vena cava inferior*. It presented a considerable curve in its course downwards; the convexity of the curve looked towards the left side. The *vena cava inferior*, even more displaced than the aorta, with which, as just mentioned, it had an abnormal relation, was situated between the last named vessel and the left ureter. It entered the posterior part of the liver to the right of the enlarged *lobus spigelii*, and passed through it and the diaphragm to the heart. In consequence of the change in the relative position of the aorta and the *vena cava inferior*, the normal relations and usual dimensions of the renal veins were reversed. The right vein passed over and anterior to the aorta, and was consequently longer than the left,—characters which usually distinguish the latter.

The umbilical vein and both umbilical arteries existed and were of the usual size. The umbilical arteries presented no peculiarity worthy of mention. The umbilical vein ascended to the liver on the right margin of the fissure, and entered directly into its substance, as I have before stated, through a slight depression on its inferior border. It had no communication with the portal vein, which was normal in every respect, nor had it any direct communication with the *vena cava inferior*, for there was not the slightest trace of a *ductus venosus*.

The diaphragm had been drawn down to a considerable extent by the weight and traction of the viscera, and presented several transverse foldings, especially on the left side.

The thoracic viscera were well formed in every respect, and appeared perfectly healthy. The heart was displaced, and seemed



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The thoracic viscera were well formed in every respect, and appeared perfectly healthy. The heart was displaced, and seemed

slightly enlarged. The base was drawn down and to the left of the median line, while the apex was thrown towards the right, and pointed to the space between the seventh and eighth ribs on the right side.

Besides the malformations and the deviations from the normal arrangement of the viscera already enumerated, there were others presented by the trunk and the extremities which require brief notice. Amongst the most remarkable of these was a considerable lateral and antero-posterior distortion of the vertebral column, which caused the trunk to be bent forwards and to be somewhat doubled on itself, whilst it projected considerably to the left side. The lumbar vertebræ were principally involved in the distortion, and formed a curve, the convexity of which looked towards the left.

Both the superior and the inferior extremities were deformed, the former presenting malformation by redundancy, the latter malformation by defect. The arms were somewhat flexed and distorted. Each of the hands were polydigital; the right having a sixth finger almost completely developed on the inner side of the fifth metacarpal bone; and the left having also a supernumerary but very rudimentary digit, on the corresponding metacarpal bone. The legs were much twisted, and the feet affected with talipes. The left foot had only four metatarsal bones and three toes; the proximal phalanx of the great toe appearing to articulate with two of the metatarsal bones. The right foot possessed four toes, the second consisting of the rudiments of two placed side by side, and conjoined at their proximal extremities.

Case II. The next monster I have to describe was a female foetus, nearly full grown, which had a more extensive, more complete, and at the same time more complicated eventration than that just noticed. The sac and the viscera had been much lacerated and bruised during the expulsion of the foetus through the maternal passages; and moreover the whole body, but more especially the eventrated parts, were in a very soft state when it reached me, in consequence of the time that had elapsed between the birth of the foetus and its receipt at the university. I mention these circumstances, because they prevented me from making a very accurate examination of the general arrangement of the parts, and will consequently prevent me from describing their anatomy with such minuteness as I could have desired.

Although the sac had been almost entirely destroyed, yet some shreds, or riband-like portions that still remained attached to the trunk, enabled me to demonstrate its existence, and to analyze its structure. It resembled the sac enclosing the viscera in the preceding case in its general appearance, but differed from it in

one important respect, namely, that it consisted of two instead of three layers, which, although matted together here and there by numerous small isolated patches of coagulable lymph, were not adherent to any of the viscera. The outer layer was traced in connection with the integument of the abdomen and of the thorax, and with the theca of the umbilical cord; it was hence known to be the amnion. The inner layer was continuous, with the serous membranes lining the abdominal and thoracic cavities, and was discovered to be compounded of the parietal layers of the peritoneum and pleura.

The eventrated viscera were the heart and the lungs, the liver, the spleen, the kidneys, and the suprarenal capsules, the stomach, and the larger proportion of the intestines. The fissure or space in the parietes of the trunk, through which they were connected to the rest of the body by their blood-vessels, nerves, and mesenteries, extended from near the first rib to the pubis, and inclined to the left of the median line. Its breadth did not correspond in any degree with its length, for it did not measure more than an inch and a half across at its widest part.

The lungs, although thrown out off the thorax, and exposed to the usual modifying influences, were not at all malformed, and appeared normal in every respect. The heart was removed entirely from the thorax, and was placed near the situation of the umbilicus, its apex pointing to the left side, and, from a considerable distortion of the trunk, nearly touching the pubes. It was flattened out, and was very obtuse at its apex, so that it resembled the heart on a playing card in its general contour. The vessels at the base were observed not to have their normal position, and therefore the structure of the heart itself was examined, and the following interesting arrangement of the parts was disclosed by a little dissection. The ventricles, as far as their general structure, and the thickness of their walls are concerned, were naturally and perfectly formed. The auricles were also normal. The ventricular septum, however, exhibited an appearance which is quite unusual at the period the fœtus was born; it was incomplete above, a free communication existing between both ventricles over a well-defined semilunar process of the substance of the heart, which projected upwards from the apex, and separated them at their lower part.

Both ventricles opened into a common vessel situated at their base. This vessel presented three well-defined semilunar valves at its commencement. It expanded into a large bulb or sinus immediately above the valves, and shortly after contracted again, and then continued onwards without any very marked increase or decrease in its calibre, at least for some distance. It formed an arch, from the summit of which three vessels passed off, whilst a

fourth was sent off from its concavity. The latter vessel attracted immediate attention, from the singularity of its position, and its distribution. It commenced at the concave side of the arch, near the constricted part of the bulb of the trunk from which it was derived, and after passing upwards a short distance, divided into two branches, one of which passed immediately into the left lung, whilst the other coursed behind and beneath the arch of the primary vessel, and having subdivided, entered into the three lobes of the right lung. The three branches that came off from the summit or convexity of the arch were severally the innominate, the left carotid, and the left subclavian arteries.

From the nature and distribution of these vessels, it would appear that the larger vessel, that which opened into both ventricles, was the aorta, formed to receive the blood simultaneously forced into it by both ventricles; and that the vessel given off from its concavity and distributed to the lungs was the pulmonary artery, which, although of such small size, was large enough to convey the requisite amount of blood to the lungs for their growth and nutrition during foetal life.\*

The liver was somewhat compressed and flattened, but still appeared globular. It occupied an oblique position from left to right, and rested chiefly on the kidneys, spleen, and stomach. The *lobus spigelii* was increased in size, and projected forwards from the surface of the liver. It pressed against the gastro-hepatic omentum, in which it had made a considerable impression, but it did not appear to have displaced the stomach, at least to any very great extent. It had been broken off from the body of the liver.

The stomach was elongated and puckered. It had an oblique direction from left to right, the greater extremity looking upwards and the pylorus looking downwards. It rested, before the parts had been displaced, on the enlarged *lobus spigelii*. The intestines were puckered together in the same manner as those in the first monster, but from a different cause. The mesenteries appeared to be simply drawn together and constricted at the margins of the fissure, without any inflammatory contraction or thickening being visible.

The spleen was flattened and fissured, but had no hilus. It was placed above all the other viscera and behind the liver. The pancreas was dissected, but nothing can be said about it, since it had broken up into several small pieces.

The left kidney and the left suprarenal capsule were displaced, but retained their ordinary shape and appearance. The right kidney was triangular and fissured, and was situated at some dis-

\* It would be more consistent with correct anatomical description to consider the enlarged portion of the vessel arising from the ventricles as a *bulbus arteriosus*, and the pulmonary artery and the aorta as its branches.

tance from the corresponding suprarenal capsule. Both the latter seemed to have suffered severely from compression by the liver. The ureters descended in the normal manner to the bladder, which projected slightly from the lower part of the fissure.

The genital organs, both internal and external, were perfectly well formed. The latter, as well as the anus, which was perforate and of its ordinary size, were drawn somewhat forwards and to the left side.

The vertebral column presented a considerable lateral curvature, which involved the dorsal and lumbar regions. The convexity of the curve looked towards the left. The vertebral column also exhibited an antero-posterior curvature, by which the body was nearly doubled on itself. The anterior extremities of the ribs on the left side were wanting.

The superior extremities were wonderfully deficient. The left arm was altogether wanting, not the slightest rudiment of any part of it being discernible. Near the place where the shoulder should have been, a small depression in the integument was observed, but there were no marks of a cicatrix. The right upper extremity appeared like a long pyramid, curved at its apex. It seemed, before it was dissected, to consist of an arm, a fore-arm, and a finger, which was partially flexed. On cutting into it, no trace of muscular fibre could be discovered in any part below the scapula; adipose tissue and condensed cellular membrane alone seemed to form the whole of the fleshy part of this singular looking extremity. The bones were seen to be arranged in the following manner. The humerus was articulated to the scapula above, and anchylosed to a bone, which might be held to represent the radius, the ulna, or both, below. Where the anchylosis or junction existed, there was a slight curve, and as slight a projection. At the lower extremity of this bone, a pile of five cartilaginous nodules were detected, which might be severally supposed to represent the carpus, metacarpus, and phalanges.

Case III. I am unable to give a full description of the anatomy and general appearances of this third monster, since the eventrated viscera had been cut out, attached to the umbilical cord and a portion of the integuments of the abdomen, whilst the body was consigned to the grave. Still, the parts that have been preserved will enable me to point out a few circumstances that appear worthy of notice.

The sac seemed to have been attacked by inflammation at some period before the birth of the fœtus, for it was inseparably united to the protruded viscera by lymph or some other matter. It could not be removed from the viscera even by a scalpel. At its circumference, however, it was separated with a little care into two layers, which I need particularise no further than to say that

they were the amnion and the parietal layer of the peritoneum. It seemed to enclose the intestines in a kind of close leathery tunic.

The stomach, the spleen, and a considerable portion of the intestinal canal were all the viscera that had been displaced. The stomach was very much contracted, and was tied to the left margin of the fissure, which was evidently of slight extent. The spleen was very small, and appeared like a piece of glandular flesh rolled up into a ball about the size of a nutmeg. It also was closely invested by the sac. The gut was very much puckered, more so than in either of the preceding monsters. This circumstance is explicable on the great contraction which the mesentery had undergone from the inflammation.

I am unable to state whether or not the trunk of the monster was distorted, or the feet and arms imperfect or deformed; but I have no doubt they must have been to some slight extent.

*General Remarks.*—The three cases of monstrosity I have just described are good examples of some forms of that large and extensive group of malformations by displacement, and by arrestment of development, which are characterised and are known by fissure of some part of the anterior parietes of the trunk; by eventration forwards and to one side of part if not of the whole of the viscera normally contained within the abdomen, the thorax, or both these cavities; by the existence of a sac depending from the parietes of the trunk which is composed of several peculiar structures and invests the displaced viscera; by deformity or defective development of other parts of the body; and by a combination of circumstances which render the fœtuses, so malformed, unviable.

The fissure in the parietes varies considerably in its extent and in its position in almost every individual case of the malformation; it appears always, however, to occupy more or less of one of the three following positions; first, the abdominal parietes; secondly, the abdominal and thoracic parietes; and thirdly, the abdominal and pelvic parietes. To these three different positions of the fissure, a fourth must be added in which it involves the whole length of the trunk. How it has been observed that the viscera present certain differences in their structure and in their relative position according to the site and extent of the fissure; and these differences, combined with a relation supposed to exist between the nature of the eventration and the deformity or defect of other parts of the body, have been adopted by Isodore G. St Hilaire\* as the basis of their arrangement into a natural family, which is subdivided into many distinct genera.

The following table exhibits the arrangement followed by St Hilaire.

\* *Histoire des Anomalies*, vol. ii. p. 206.

**A. Monstrosity not involving the thoracic region.**

1. Lateral or median eventration occupying principally the lower portion of the addomen; urinary apparatus, genital organs and rectum opening externally by three distinct orifices. Family I. *Aspalosomus*.

2. Lateral or median eventration occupying principally the lower portion of the abdomen; genito-urinary apparatus absent or very rudimentary. Family II. *Agenosomus*.

3. Lateral eventration occupying principally the lower portion of the abdomen; absence or very imperfect development of the pelvic member of the side occupied by the eventration. Family III. *Cyllosomus*.

4. Lateral or median eventration throughout the whole length of the abdomen; the trunk curved after the abdomen; the pelvic members absent or very imperfect. Family IV. *Schistosomus*.

**B. Monstrosity reaching the thoracic region also.**

5. Lateral eventration occupying principally the superior portion of the abdomen, and involving also the anterior part of the thorax; atrophy or very imperfect development of the thoracic member of the side occupied by the eventration. Family V. *Pleurosomus*.

6. Lateral or median eventration with fissure; atrophy or total want of the sternum and hernia of the heart. Family VI. *Celosomus*.

In this classification of Isodore St Hilaire much stress is laid on the position of the eventration and on the degree of imperfection of the extremities, independent of the characters afforded by the displaced viscera for the distinction and recognition of genera. Thus the third and fourth families, the *Cyllosomus* and the *Schistosomus*, which do not present any material differences in the conformation of the viscera, are separated from each other in consequence of the eventration being lateral, and one of the inferior extremities being imperfect in the one, and of the eventration being either lateral or median, and both lower extremities being absent or very imperfect in the other. And again, the fifth family is distinguished from both these, in consequence of the thorax being slightly affected, and by one of the superior extremities being imperfectly developed. Now, if characters such as these were generally adopted as the basis of a classification of monsters with eventration, the number of distinct genera would be increased to an almost indefinite extent, and it would be rendered necessary to coin a new name for almost every individual example that has been described. Such characters, however, are fallacious and totally inadequate, and unfit for the purposes of a sound classification.

In the first place, the eventration is never truly median, but



always lateral. In every instance of this form of monstrosity that has been described and figured, the umbilical cord, when it is present, or the umbilical vein, when the cord is absent in consequence of the placenta being adherent to the eventration, is found to occupy a lateral position in regard to the eventration, to terminate more or less directly in the integuments and in the sac, either on the right or on the left side of the fissure in the abdominal parietes. In the normal state, the umbilicus is placed in the median line of the body; hence, if the position of the umbilical cord, or the position of the umbilical vein, be taken as affording satisfactory evidence of the exact situation and relations of the eventration, we shall find that the viscera are invariably displaced from the abdominal cavity on one or other side of the median line, in other words, always occupy a lateral position.

In the second place, numerous examples of this form of monstrosity are recorded, in which the fissure has extended through the whole of the abdominal and also through part of the thoracic parietes, without either one or both of the superior extremities, or even the inferior extremities, being imperfect, although they were deformed. In fact, some of these monsters, instead of presenting defective development of the extremities, exhibit evident signs of malformation by redundancy. I shall have occasion, as I proceed, to point out many other circumstances which show the insufficiency of St Hilaire's arrangement. To enter into the various points in which it is defective, would oblige me to anticipate the whole history of these monsters.

A careful examination and revision of the numerous cases of eventration which have been recorded by recent observers have led me to believe that they may be most satisfactorily arranged according to the peculiarities they present in the conformation of the viscera, irrespective of the condition of other parts which I esteem of secondary importance in their history; and that a classification, based on such peculiarities, or rather characters, will give a more comprehensive and more concise view of the present state of our knowledge of the organization of these monsters than one erected on the innumerable modifications in the development of the extremities, or on other variable characters; and will include all those cases, by no means few in number, which it would be otherwise absolutely necessary to separate from the rest, and constitute into distinct genera.

Taking the conformation of the viscera as a guide for a natural arrangement, I shall separate these monsters into two groups, namely, monsters with simple, and monsters with complex eventration. The first group will comprehend all those monsters in which the displaced viscera present alterations in their configuration only. It admits of no subdivision. The second group will

comprehend all those monsters in which the bulk of the viscera are not only malformed, but, at the same time, exhibit some very material defect in their development. This group admits of subdivision into genera, each genus being characterized by the imperfect development of some peculiar viscus or viscera.

The following table will show the nature of the arrangement I have thought proper to adopt for the purpose of detailing the organisation of these monsters.

“A,” monsters with simple eventration.

Family I. Eventration involving more or less of the abdominal or of the abdominal and thoracic viscera; the viscera for the most part simply malformed.

“B,” monsters with complex eventration.

Family II. Eventration abdominal and pelvic; the intestinal canal more or less incomplete; the cæcum and the genito-urinary apparatus opening by distinct apertures in a cloaca.

Family III. Eventration abdominal and pelvic; the genito-urinary apparatus imperfect; the intestinal canal normal.

Family IV. Eventration abdominal and thoracic; the heart displaced and imperfect.

Family V. Eventration pelvic, abdominal and thoracic; the cæcum and genito-urinary apparatus opening into a cloaca; the heart displaced and imperfect.

Before commencing with the special consideration of each group of these monsters, I may remark that the above table, and the following descriptions, do not probably embrace all the different forms of eventration that have been observed, for it is utterly impossible to take cognisance of a very large number of the recorded cases, in consequence of the very vague and obscure statements and figures with which the notices are accompanied. I shall be enabled, nevertheless, to point out the more striking and important features in the anatomy of these monsters, and to indicate where our information is defective.

CLASS I. FAMILY 1st.—“MONSTERS WITH SIMPLE EVENTRATION.”—This group includes by far the greater proportion of the recorded cases of monstrosity with eventration, and comprehends all those in which the fissure extends through more or less of the abdominal parietes, and it may be of the thoracic parietes, the viscera being displaced, and presenting such modifications in their configuration only as are referrible either to a change in their relative position, combined with the action of pressure in certain directions; or to an unnatural increase of the normal size of some parts; or to disease; or, lastly, to a combination of all these modifying influences.

The smallest, and, at the same time, simplest eventration that has been recorded, is that presented by the third monster describ-

ed in the first part of this notice, and which consisted of the stomach, of part of the intestines, and of the spleen. From this we are led by a gradual series of gradations to the highest form of the simple eventration; the liver, one or both kidneys, and supra-renal capsules; the pancreas, the testes, if the monster be male; the heart; and, lastly, the lungs, being successively added to the eventration, in the order I have enumerated, the displacement then involving almost all the abdominal and thoracic viscera.

When the liver is displaced, which it usually is, it appears to undergo greater alteration in its configuration than any other organ in the body; a circumstance which seems to depend on its great size, and on its very prominent position leaving it exposed to the influence of every modifying action, but more especially to that of pressure. Its edges are rounded off; its right and left lobes are thrown together and undistinguishable; and thus it loses its peculiar elongated flattened figure, and assumes one more or less globular. Its substance, in fact, becomes compressed into that form which permits the greatest amount of material to be enclosed in, and therefore occupy the least space. The extent of the modelling process by which the liver is made to assume a somewhat globular form is beautifully illustrated by those cases, by no means uncommon, in which the umbilical vein, instead of coursing along the posterior surface of the liver, is enclosed within its substance, which would thus appear to have been moulded on and around the umbilical vein during the development of the organ.

It must be remarked, however, that although the form of the liver is very generally altered, in the way I have just described, yet it is not invariable; for, occasionally the lobes are distinct, and retain their normal shape, the shape of the liver not being materially altered. This latter circumstance is of very unfrequent occurrence, and may be justly esteemed as an exception to the general rule.

I have not met with any case on record in which the *lobus Spigelii* presented the remarkable development, and had effected so great an alteration in the position of the stomach, as in the first monster I have described. Otto\* mentions a somewhat parallel instance, in which the liver seemed to consist of two distinct portions; the smaller portion being adherent to the larger, at the transverse fissure, the two being united by the *vena cava inferior*. It is interesting to observe that this enormous increase in the size of the *lobus Spigelii* is merely an exaggerated state of the normal state of the lobe, and that it affords a striking example of the power nature possesses of preventing pernicious results from en-

\* *Hist. Sexcent. Monstr.* Wherever reference is made to the observations of Otto, which I shall frequently do, it is always to this work, and to one or more of the monsters between the DXIV. and DXLIV. cases.

suing on abnormal actions, by taking advantage of the tendency which some organs exhibit of enlarging in certain directions. I have made observations on more than 120 subjects in the dissecting room of this University; and they appear to me to show that the size of the *lobus Spigelii* bears an inverse ratio to that of the left lobe of the liver; that it is largest when the left lobe is smallest, and *vice versa*. No part of the liver in the normal state offers more peculiarities in its form and size than the *lobus Spigelii*.

The gall-bladder is sometimes wanting; and, when present, is always found in a collapsed state. There is also usually a depression in the liver into which it is received. The *ductus communis choledochus* appears to be always present and normal.

The stomach presents little worthy of notice. Its form is seldom altered, but its position may be altered considerably, as we have already seen.

The intestines are always displaced to a very great extent, and present some appearances which are peculiar to this form of monstrosity. In the first and third of the monsters I have described, they presented very evident signs of having been the seat of inflammation. It would appear, however, from the observations of others, that the gut, in the majority of cases, is free from disease, and is distended with meconium. Frier\* describes a monster with simple eventration, in which the intestines were both greatly inflated and inflamed; and Otto mentions several others in which there were indications of inflammation having attacked the gut at some period before birth. I have already spoken of the puckered appearance of the intestinal canal in these monsters, when describing the three cases I have noticed, and have only to add, that it is produced by a contracted and constricted state of the mesentery and mesocolon, which is induced, either by the tight embrace of the fissure, or by inflammation, the latter appearing much the more effectual of the two.

The rectum is never displaced from the pelvis. It is also perfect, and terminates at the anus, which is usually drawn forwards, and to one side, by the weight and traction of the viscera.

The spleen, the pancreas, the kidneys, and the supra-renal capsules are found differently modified and malformed, in different cases, according to the position they may happen to occupy in the eventration, and to the age of the individual. They may be more spherical or more flattened than usual, or they may be pyriform or pyramidal; in fact, they present every variety of form and figure which these organs may be made to assume, by pressure operating in different directions during development. The spleen is always found without the abdomen resting on the imperfectly-

\* Sandifort, Thesaurus, Vol. i. p. 314.

formed parietes. One or other of the kidneys and supra-renal capsules will also be discovered without the abdomen, whilst the opposite one is only partially displaced. The pancreas is always displaced, but is never carried much out of its usual position, relatively to the other viscera.

The testes present great variation in their position in different cases, a circumstance easily accounted for, in the alteration they naturally undergo in their position during their transit from the abdomen to the scrotum. It is seldom that they are found in the eventration, and, when discovered in it, it is usual to find one more retarded in its course than the other.

When the lungs and heart are eventrated, they do not offer any peculiarities worthy of mention, except the alteration in their position, which is sometimes very great. When they are contained within the thorax, the heart generally presents a remarkable displacement, which has not been much attended to by those who have dissected and described examples of this monstrosity. I have noticed in one case, and Otto has remarked in many others, that the heart, instead of being situated obliquely in the thorax, assumes a perpendicular, or more frequently, according to Otto's observations, a transverse position. This arises from the displaced abdominal viscera dragging downwards the *vena cava inferior*, which, reacting on the base of the heart, throws the apex of that organ more or less out of its position. It will be readily seen that it is only when the viscera depend greatly from either the right or the left side of the abdomen, that the heart will be found to occupy either of the abnormal positions above described, since the base of the heart must not only be dragged down, but also be carried towards one or other side of the body, before the apex of the heart can be made to revolve and point directly outwards. This is found to be the case, for it is only when the viscera incline very much to one side that the heart is found displaced.

The diaphragm, if the thorax be not involved, will be perfect, but of course will be greatly displaced. If the thorax, however, happen to be fissured, and its viscera be eventrated, then the diaphragm will be imperfect at its sternal and costal border; the degree of imperfection varying with the extent of the fissure, and the degree of completeness of the eventration.

The organs of generation, both internal and external, are generally well formed; the latter will be found inclining somewhat towards the side occupied by the eventration.

The larger blood-vessels are always carried to one side by the viscera, and their relations will be modified accordingly. It is needless for me to particularize the many variations which have been noticed, since their arrangement, as described for my first

monster, will suffice to give an idea of the usual appearances presented by them. One circumstance connected with the umbilical vein requires some attention. The curious aberration from the normal distribution and communications of this vessel at the liver, observed by myself, does not appear to have a parallel on record. There is frequent mention in Otto's great work on monsters of the umbilical vein penetrating directly into the liver, but there is no notice made of its ultimate distribution; it would appear, however, from an observation of Breschet's on a monster with complex eventration, that the umbilical vein, although it does enter the upper surface of the liver, may yet have direct communication with the portal vein and the *vena cava inferior*. What may be the exact distribution of the vessels of the liver, where no direct communications between them can be detected, still remains a mystery. The liver in my own case was attempted to be injected, but the attempt was unsuccessful. We might perhaps be enlightened on this curious and interesting subject by subsequent observations made under favourable circumstances.

It would appear from the observations of Meckel\* and Otto, that it is not uncommon for one of the umbilical arteries to be absent; and what is more remarkable, whenever it is absent, it is invariably the right.

In connection with the modifications in the configuration of the eventrated viscera, it will be necessary for me to offer a few remarks respecting the state of the extremities and of the skeleton generally. One or more of the extremities are deformed and generally imperfect. The deformity is usually, but not invariably, confined to the feet and hands, the former being affected with talipes, the latter being twisted in various directions. The imperfection, when present, exhibits every grade of complexity between the absence of one or two toes or fingers, and the complete absence of one or both of the superior or of the inferior extremities. It is uncommon, however, to meet with the total loss of a limb, though many cases of the kind are recorded; for rudimentary traces of it might be seen, or the whole limb might be much atrophied. It might be stated as a general rule, that the malformed extremity is closely related to the site and position of the eventration; thus, the eventration being restricted to the abdomen, the lower extremities will be imperfect, but having involved the thorax, the superior extremities will be chiefly implicated; and, moreover, the eventration inclining to the left side, the left extremity, whether it be arm or leg, will be the one found imperfect, or depending from the right side, the right extremity will be discovered to be defective of some part. This

\* Hist. Monst. Nonnullor. and other works of this author.

rule would appear to point to some influence exerted by the eventration over the extremity, which influence would seem to act uniformly; but we cannot trace any influence, direct or indirect, causing uniform imperfection of the extremities, which should happen if there was any real connection between the eventration and the malformed extremity or extremities. It will be as well, perhaps, to illustrate this by mentioning the more striking exceptions to the general rule. 1. The abdominal viscera alone being eventrated, the lower extremities are not malformed; on the contrary, they are perfect, whilst one of the upper extremities is imperfect. An example of this variation is given by Otto,\* in which the feet were perfect, and the right hand had but three fingers. And another still more striking is noticed by Cam, (Med. Phy. Journ. No. 39,) where the lower extremities were perfect, but the left upper extremity was altogether absent, there being "no clavicle, no scapula, no humerus, or any arm on the left side." 2. The abdominal viscera being eventrated, and inclining greatly to one side, the opposite limb, and not the one corresponding to the eventration, is imperfect. As an instance of this, I may quote a case recorded by Humby,† in which, the eventration inclining to the left side, "the left foot was perfect," but "the right was shapeless, and had two toes only." 3. The eventration being in the same condition as in the last-mentioned exception, both, and not one of the lower extremities, are malformed. This is the most common variation met with. For an example of this, I may refer to the description of the first monster noticed in this paper, where it is seen in its slightest degree; and to a monster described by Fingerhault,‡ which appeared to have one extremity wanting, and the other in an extremely rudimentary state, for its highest degree.

It is to be remarked, that although these monsters are characterized by malformation by defect of development in more parts than one, yet some of them exhibit at the same time malformation by redundancy. This circumstance appears somewhat paradoxical, but yet is one of the most curious and most remarkable features in the history of these monsters. I have only to refer to my first monster, which had an additional finger on each of the hands, and to one described by Hasenest,\* which had a super-

\* Op. cit. Case DXXI.

† Humby, Med. Phy. Journ. vol. iii.

‡ Meckel's Archives für Anatom. und Physiolog. t. i. p. 109. 1828. It is impossible to determine from Fingerhault's description to what class of eventration the monster is to be referred. I have little doubt that it was a simple eventration, although this cannot be made out. The case is merely referred to as an example of the highest form of the defective development of the extremities in these monsters.

§ Hasenest, Act. Academ. Nat. Cur. t. vi. Obs. x. 1742.

numery toe on one of the feet, as examples of this kind of malformation.

The trunk is invariably distorted, but the degree of distortion varies in every individual case, without any relation to the extent of the eventration. When the trunk is but slightly distorted, the lumbar vertebræ alone appear to be implicated; but when it is very great, the whole vertebral column, the pelvis, and the ribs are all twisted and displaced, so that they appear to unite in causing the distortion and excurvation of the trunk, by coalescing and pressing one on the other. It is to be remarked that the trunk, in very severe cases, becomes doubled on itself, and this doubling appears to be different in its character in the human fœtus and in the young of the mammals. In the human fœtus, when the body is doubled on itself, and this happens more or less in every case, the vertebral column is bent back, so that the chest and pelvis are approximated. The doubling up of the trunk in the eventrated monsters of the lower animals differs from that of the human fœtus in a most material point. Here the trunk is bent downwards (anteriorly), and sometimes to an almost incredible extent, causing the sacrum to come into immediate contact or into close relation with the lumbar, dorsal, or even cervical spines.

The greatest degree of distortion being seen in monstrous fœtuses taken from the sheep or cow, I shall give a brief account of the peculiarities seen by Otto\* in the skeleton of one from which the viscera had been removed, more especially as it shows how greatly the bones of the trunk may be altered in their form by the occurrence of an eventration. "The left ribs were small, compressed, and hid from view under the left scapula. The pelvis was curved backwards and to the right side, so that the brim looked backwards, and the anus and tail were directed forwards and rested on the right thoracic parietes. The posterior extremity of the vertebral column was so distorted that the spines of the sacrum were opposed to those of the anterior lumbar vertebræ, their apices being united by ligamentous substance. The spinous processes of all the lumbar vertebræ, and of the last dorsal vertebra were greatly curved, and were ankylosed and conjoined. The left ribs could not be enumerated, because all, with the exception of the first, had been united into one great osseous lamella. There was no vestige of a sternum."

The ribs or the sternum, or even both, are always more or less imperfect when the thoracic viscera are eventrated.

I have described the chief peculiarities presented by monsters with simple eventration with this degree of minuteness, and have pointed out where the modifying actions are seen to exert their influence in the most striking manner, not only because monsters

\* Op. cit. Case DXXX.



of this class are of the most frequent occurrence, but because the same peculiarities and the same modifying actions are observed in the next class, and hence much repetition, otherwise necessary, will be avoided. I now pass on to the consideration of

CLASS II. "MONSTERS WITH COMPLEX EVENTRATION."—The preceding group of monsters, we have seen, are characterised by the viscera being modified in their configuration by pressure, as instanced by almost all of them; by increased development of some parts, as in the case of the *lobus Spigelii* in one of my own cases, and in another noticed by Otto; and by disease, of which we have a most striking example in the puckering of the intestinal canal as the result of inflammation of the mesenteries. In this group, which comprehends all the more grave instances of eventration, we have—in addition to the different circumstances causing an alteration of the configuration of the viscera—a very important character, which separates it at once from the preceding, namely, defective development of one or more of the viscera, which induces an alteration in their "conformation."

It will be seen by reference to my arrangement that three different systems are liable to be imperfectly developed, the digestive system, the genito-urinary system, and the vascular system. It will also be seen that I have arranged the examples of complex eventration into four families, according to the system which might be most imperfect. The first and second of these families, although widely separate at their two extremes, are united by intermediate forms, which lead gradually from the highest form of the malformation to the preceding group, in which the viscera must be considered to be in a comparative state of perfection. The third family presents the opposite extreme to the two former families, the thoracic, instead of the pelvic and abdominal organs being imperfect; it is interesting to observe, however, that we are enabled to trace a transition from its typical form towards the simple eventration. The two extremes of imperfection are united by a fourth family, which presents the intestines, the genito-urinary apparatus, and the heart imperfect in one individual. With these preliminary remarks I shall proceed to trace the relation which each family bears to the others, by describing first what might be considered to be the typical form of the peculiar malformation, and then the transition forms, as far as observation will carry us.

FAMILY 2d. This family is characterised by the colon being more or less defective, by the cæcum opening into a cloaca situated in the right groin, in which the orifices of the genito-urinary apparatus also terminate. The principal feature in this family is the cloaca, which is dependent, as will appear hereafter, on the imperfect condition of the intestinal canal, and on the perforate state of the cæcum.

The most perfect and typical examples we have of this genus are those monsters which have been described and figured by Petit,\* Knox† Otto,‡ and Vrolik,§ which, as they present nearly the same peculiarities, except such as arise from a difference in sex, I shall notice in common.

The small intestines are for the most part perfect, and terminate as usual at the right iliac fossa in the cœcum, which appears to be the only part of the large intestine developed. The cœcum, known by its peculiar sacculated appearance and by the valvular termination of the small intestines, opens more or less directly by a large orifice, sometimes provided with a distinct sphincter muscle, which then diminishes the size of the aperture, into a cavity situated in the right groin. This cavity, or, as it is more properly called, cloaca, has either a mucous or an integumentary surface. It is generally of large size, but its form and figure vary. It receives, besides the opening of the intestinal canal, through which the meconium may be readily made to flow by pressure on the gut, the external orifices or apertures of outlet of both the genital and the urinary organs. The number and nature of the orifices which open into it vary, as we shall presently see, according to the sex of the monster and to the degree of imperfection in which the genito-urinary apparatus is found. The bladder is usually, but not invariably, imperfect; and, when imperfect, is prolapsed and inverted, so that its posterior surface, soft, spongy, rugous, and vascular, comes to form a part of the posterior parietes of the cloaca. The bladder, when inverted, is usually spoken of as a small vascular raised surface on the posterior part of the cloaca.

When the monster is a female, the sexual orifice, which may open from the cloaca into the vagina or into the uterus, will be discovered immediately above, or, it may be, below that of the intestinal canal. The ureters will be found opening separately, and on opposite parts of the cloaca, either on each side of the sexual orifice, or laterally between it and the false anus. When the monster is a male, the arrangement of the orifices must necessarily differ, although the analogy is preserved. The bladder being inverted, we should naturally expect the ureters would open at once on the surface of the cloaca, but it would not lead us to anticipate the union of the ureter and the *vas deferens* on each side, which, forming a common excretory canal, terminates near the centre, or, it may be, near the margin of the cloaca. From these observations it would appear that a monster typical of this family, and

\* Memoires de l'Acad. des Sciences. 1719. P. 89.

† Edinburgh Journal of Medical Science, Vol. i. p. 343.

‡ Op. cit. in many different cases.

§ Tabulæ ad illustrand. embryogen. hom. et mammal. tam natur. quam abnormal. Tab. xxi.—xxiii.

having the female organs of generation, would be found to have four orifices in the cloaca, one leading into the intestinal canal, one into the sexual organ, namely, the vagina or uterus, and the other two into the ureters; and that one having a male generative apparatus, would present three orifices only, namely, one leading into the cœcum, and two common to both, the generative and the urinary apparatus.

These orifices, however, may not all be present, or may even be more numerous in some particular examples which depart from the typical form either from or towards the state of perfection. It would be useless for me to recount all the numerous varieties in the conformation of the genito-urinary apparatus that have been observed and recorded; suffice it to say, that they exhibit differences in every individual case, although they sometimes approach very closely to each other, and that they present every gradation from comparative perfection to total absence. I shall only point out those varieties which give rise to a diminution or to an increase in the number of orifices in the cloaca. If the urinary organs advance one step towards perfection, and the bladder be found perfect, which is certainly a very uncommon occurrence, then the number of orifices will be diminished; the urinary organs opening by one and not by two orifices, that single orifice being the rudiment of the urethra, which is then seen as an infundibuliform prolongation of the urinary bladder. The same diminution will be observed if the urinary organs be more imperfect than usual, as for example, if there happen to be but one kidney and but one ureter, or two kidneys and two ureters, but one of the latter cœcal and free at its extremity, examples of which may be seen in the works of St Hilaire\* and Otto. One of the openings must then be necessarily absent. We observe here that the number of orifices in the cloaca decrease whether the urinary organs progress towards or from perfection; the opposite statement holds good with regard to the generative system, and particularly to the female, for if it advance towards perfection, no difference will be observed, the vagina still opening into the cloaca; but if it recede from perfection, then two different effects will result, according to the stage of imperfection. If the generative organs be absent, as will be noticed in some cases of Otto's and in one by Breschet,† the sexual orifice will of course be wanting, and there will be the loss of one opening at least. If, however, the organs be not absent, but remain in a rudimentary state, as for instance in their early bifid state, when there are two vaginæ, two separate cornua and bodies of the uterus, &c., it will be seen that the number of apertures will be increased instead of diminished. The only instance

\* *Annales des Sciences Naturelles*, t. iv. p. 452 et sequent.

† *Med. Chirurg. Transact. of London*, vol. ix. p. 483.

I know of this kind is one described by Meckel,\* to which I refer principally on account of the beautiful delineation of the parts concerned in the formation of the cloaca.

I may briefly state, without pursuing this most interesting subject further, that the number of orifices seen in the cloaca may range from one which will be that leading from the cœcum, the genito-urinary apparatus being entirely absent, to five, the typical number being three when the monster is a male, and four when it is a female.

The colon in some few cases presents a somewhat greater degree of perfection than in those typical of the family. The advance of the colon towards perfection leads towards complete development of the intestinal canal, and therefore to the next family in which the genito-urinary organs alone are malformed. A monster described by St Hilaire† presents us with one step towards the more complete development of the intestinal canal. In it the colon was prolonged onwards and terminated in a cul-de-sac at the point where the superior mesenteric artery usually ceases to supply it with blood. Otto‡ gives us another and apparently a more advanced stage, the highest probably that has yet been observed in a monster, the colon of which appears to have been developed nearly throughout its whole extent, for it is said to terminate in the middle and anterior part of the pelvis. I might mention some others, but it seems unnecessary. It might be remarked, however, that although our existing knowledge of the nature of the colon in these cases is very slight, and its degree of development is not well ascertained, it is highly probable future observations will throw some light on the subject, and may even present us with a monster having its intestinal canal nearly perfect, its rectum complete but its anus imperforate; we only want an observation of this kind to fill up the hiatus which exists in the chain of perfection.

It is interesting to observe, that although the intestinal canal is so strikingly malformed by defect of development, it not unfrequently presents malformation by redundancy, in the form of a supernumerary appendix vermiformis opening into the cœcum.

We have seen that the internal organs of generation are more or less imperfect, and that in a manner which might lead us to anticipate great imperfection of the external organs. This is indeed the case. The male intromittent organ is represented by a papilla situated a little below and to the left side of the cloaca; that papilla being usually provided with a glans and a prepuce, but imperforate. This papilla is not always seen. The scrotum, when present, consists of two folds of the integument widely separate

\* Hist. Monstr. Nonnullorum, p. 42, Plate vi. figs. 1 and 2.

† Loc. cit.

‡ Case DXXXV.

from each other. The external organs of generation in the female are still more rudimentary. The *labia pudendi* are recognised as a fold of the skin placed on the upper part of either thigh; this curious position has been accounted for by Breschet,\* who supposes the labia to be drawn asunder by the bending of the trunk, and distortion and separation of the lower extremities. This supposition may be near the truth in most of the cases, but does not explain why the labia are found in the same position, whether the deformity of the body be slight or grave. The imperfection of the pelvis is, I believe, the chief cause of the separation of the labia.

It is necessary for me to mention the occasional existence of a small shallow cul de sac in the perineum, which Otto believes is the representative of the lower part of the vagina; it is, however, also seen in the perineum of the males, a circumstance which precludes Otto's opinion, and appears to show that, if it be the rudiment of anything, it must be of an anus.

It is a curious fact that, although the viscera are so imperfectly developed in these cases, they do not present us with any extreme instances of imperfection of the extremities. Indeed, I have not found a single instance on record in which there was the want of a few toes or fingers. The extremities, however, but more especially the lower, are invariably deformed, and in some cases may be entirely destitute of muscles, whilst the bones are perfect. The case mentioned by Breschet, and already quoted, had its right lower extremity in this state, the muscles being absent, and the limb being formed of skin, of adipose tissue, and of the bones with their ligaments.

The trunk is always more or less distorted. It inclines for the most part in the opposite direction to what it does in the simple eventrations, that is backwards, not forwards, the vertebral column being curved forwards, and as usual to one side.

Of the bones of the trunk, those of the pelvis are chiefly malformed and imperfect. The *ossa pubes* are separated from each other at the symphysis, and are greatly malformed. The ischia are generally distorted but not often imperfect. The sacrum and the coccyx also suffer with the other bones. The highest form of malformation of the pelvis we have on record, is that described by Otto, as seen in a monster in which no genito-urinary apparatus could be discovered. He says, "no pelvic cavity could be said to exist, the sacrum, the coccyx, and the three last lumbar vertebræ were absent, and the pubis and ischium were greatly deformed."

The placenta is oftentimes adherent to the sac or to the viscera, and then appears to be lobulated, a tendency to which is ob-

\* Loc. cit.

served normally. One effect of the adhesion of the placenta to the eventration, is the almost total absence of an umbilical cord. The umbilical vein always runs towards the liver on one side of the eventration; the arteries are normal.

**FAMILY 3d.** This family differs only from the preceding in the single circumstance of the intestinal canal being complete, which somewhat alters the appearance and arrangement of the parts. The genito-urinary apparatus is in a rudimentary condition, or at least is imperfect. If it be supposed that a monster of the preceding family had its colon extended to the anus, which was perforate; the aperture in the cœcum closed; the cloaca removed, in consequence, as it would appear, of being unnecessary; and the genito-urinary apparatus still imperfect; then an idea of the nature of a monster of this family, and of the state of its organization, will be formed.

It would be impossible to particularize the many peculiarities presented by the monsters of this family, nor is such a course expedient. The urinary organs generally present a type of structure more perfect and complete than that of any of the preceding family; but the genital organs, and more especially the internal being, found in much the same state, and even altogether rudimentary. The anus is brought more forwards close to the pubes, by the traction exercised on the perineum by the eventration, and probably by the external organs of generation being absent or very rudimentary.

The trunk and extremities are in precisely the same state as in the preceding family, so that there is no need of noticing them more fully.

This family is established on some monsters described by the older authors, and on a few mentioned by Otto. The older authors have not paid much attention to the exact position, and to the degree of development of the parts involved in the eventration; hence accurate information of the arrangement of the pelvic organs in this family is still required.

**FAMILY 4th.**—A third division of monsters with complex eventration present the abdominal and pelvic viscera in nearly the same condition as in monsters with simple eventration, from which they differ in having the heart imperfectly developed as well as displaced.\*

The second monster I have described in this paper exhibits all the more prominent features typical of a monster of this peculiar class. This will render it only necessary for me to indicate some points in which it agrees, or in which it differs from those described by others. In all, the ventricles of the

\* The fissure in the parietes extending upwards into the thorax, whilst the pelvic parietes are well formed.

heart have free communication with each other at their base, where the *septum cordis* is more or less deficient. In most cases, as in my own, in that described by Steno,\* in others noticed by Gurlt† and by Otto, all of which are typical of the family, the *septum cordis* is deficient above and complete below, and the aorta takes its origin from both ventricles, and consequently received the blood from both at each systole of the heart. The pulmonary artery is, of course, a branch of the aorta. In one described by Meckel,‡ which gives us one of the transition stages between this division of the complex and the simple eventration, the structure and arrangement of the parts in and about the heart were different. The *septum cordis* was complete both above and below, but had a roundish opening near its centre, through which the ventricles communicated. The aorta took its origin from the left, the pulmonary artery from the right ventricle, and there was no communication between them at this particular situation. The pulmonary artery was much larger than the aorta; so much so, indeed, that the descending aorta appeared to be a mere continuation of the former vessel. In this particular case, which is, I believe, the only one of the kind on record, the venous and arterial blood was co-mingled in the ventricles, but yet it passed to the different parts of the system through its usual channels.

This family differs from the two preceding, in the monsters composing it having the extremities, and more particularly the superior, in a very imperfect state. This character causes it to approach very closely to the simple eventrated monstrosities. The parietes of the thorax are always imperfect.

It is much to be regretted that searching examinations have not been instituted on all monsters with eventration which have the heart displaced. If this had been done, it is very likely a host of cases would have been recorded, in which the heart would have been found imperfect, and perhaps have exhibited every stage of gradation from comparative perfection to extreme imperfection.

**FAMILY 5th.**—I have established this genus on one solitary example, which I believe, however, is not without its parallel. It is one described by Otto, which unites all the imperfections presented by the first and third families of monsters with complex eventration, but yet cannot be classed with either of them.

In this case, the fissure in the parietes extended through the thorax, the abdomen, and the pelvis, and the whole of the

\* Act. de Copenhague, obs. 109. 1671, 1672.

† Lehrbuch der Patholog. Anatom. de Haussengeth, page 133.

‡ Loc. cit. p. 21.

viscera usually contained within these cavities being displaced, the thoracic and the pelvic organs being at the same time incomplete. The colon was absent, and the cœcum opened into a cloaca, the parietes of which were formed in part by the posterior surface of the urinary bladder, which was inverted. The cloaca also received the orifices of the urinary and the genital organs. The ureters terminated at once in it. The genital organs were malformed, the external organs being absent, and the internal being divided into two distinct portions, one-half of the uterus, one Fallopian tube, and an ovary being on one side of the eventration, and a similar series of parts occupying the opposite side.

In so far, therefore, as the above characters are concerned, the monster might be considered as an example of the second family of my arrangement; but it presented, at the same time, the peculiarities of the preceding family, for it had the *septum cordis* imperfect, a free communication between the two ventricles of the heart, and the aorta arising from both of them.

The inferior extremities were shorter and slighter than usual, and were greatly deformed. The feet and hands were also imperfect, but to what extent is not stated.

Now, although I have established this family on one monster, I am of opinion that many of those which must at present be ranked amongst the examples of the second family, would, if the heart had been carefully examined, have been found to present all the characters which are necessary to constitute them examples of this family. At any rate, this monster of Otto's is an extremely interesting one in a teratological point of view, inasmuch as it unites in itself the organization of the two opposite groups of monsters with complex eventration, namely, those with the pelvic and those with the thoracic viscera incomplete.

Having enumerated the chief peculiarities and the different degrees of complexity visible in the organization of this class of monsters by defect, we are enabled to discern the close relation which subsists between the various families into which they have been separated and arranged merely for the purpose of accurate and concise description; and we are also enabled to observe that monsters with eventration constitute a distinct teratological group, the extremes of which are united by a series of gradations leading insensibly from the one to the other.

Before proceeding to discuss the much contested point of the intimate nature and mode of origin of these monsters, it will be necessary for me to advert to some circumstances not mentioned before, which are presented in common by both groups and each family.

I shall first make a few remarks regarding the sac. This



structure is always present in connection with an eventration, whether slight or grave, although it has been often overlooked or been unperceived by the observer, in consequence of having been lacerated and destroyed during labour, or of having been adherent throughout its whole extent to the displaced viscera. In both these cases, the viscera would perhaps be described, as they have often been hitherto, as naked or devoid of covering. Such statements might be made very naturally, if the observer happen to be unacquainted with the structure, or the means of detecting the existence of the sac when it is firmly adherent and inseparably united nearly throughout its whole extent to the eventrated viscera; but a previous knowledge of the subject, and a little attention and dexterity, will enable those who have opportunities of investigating and examining the anatomy of these curious aberrations of nature, to satisfy themselves of the existence of the sac, and of the exact nature of its component parts. It invariably consists of two membranes resembling each other in their general appearance and in their ultimate structure; sometimes, however, a third membrane is added to the sac, but its presence in it appears to be accidental, and is to be ascribed to the numerous adhesions which had been contracted between the layers of the peritoneum. These two membranes are occasionally distinct from each other, but are more frequently united together or to the viscera by lymph, when they may be readily distinguished and separated from one another at the margin of the fissure in the parietes, where a space equalling the whole thickness of the parietes intervenes between them.

The outer of the two membranes is the amnion still unchanged. The inner membrane is the parietal layer of the peritoneum. I mention this again and in this place, because a different analysis of the sac has been given by two talented observers, Breschet and Meckel,\* who agree in referring the outer membrane to the amnion, but consider the inner to be the chorion. Breschet supposes the inner membrane, or chorion, to be lost in the *cutis vera*. Meckel, again, imagines it to be continuous with, and not the parietal layer of the peritoneum. But both these opinions are incorrect. The passage of this membrane behind the imperfect abdominal parietes, its exhibiting the usual bluish translucency of a serous membrane, and moreover its evident serous structure in all parts, at once show its exact nature, and prove it to be the parietal layer of the peritoneum.

My own observations show that the pleura will also be connected with the sac when the thoracic viscera are eventrated.

\* In the works already cited.

Monsters with eventration have other parts of the body imperfect besides the abdominal and thoracic parietes and viscera, and the extremities; thus the eventration is often associated with malformation of the vertebral column, or the cranium, or of both, many of the monsters having hemicrania or *spina bifida*. *Spina bifida* appears to occur very frequently in conjunction with complex eventration, for I find more than two-thirds of the cases I have been enabled to collect are affected with it. One-half of the remaining third are hemicephalous; so that but one-fifth of the whole are completely free from complication, if I may employ such a term. Monsters with simple eventration, on the contrary, are more frequently affected with hemicrania than *spina bifida*, though it is but seldom they present either complication.

One curious circumstance in the history of these monsters is, that the placenta is never adherent to the sac in simple eventrations, and only in one form of the complex, namely, that having the intestinal canal and genito-urinary organs imperfect, —the second family in my arrangement. Thus, in forty-eight cases of the monstrosity, thirty were examples of simple eventration, in none of which was the placenta adherent, or any morbid adhesion between the foetal membranes visible; the remaining eighteen were examples of complex eventration, in nine of which the placenta was adherent, and these nine were all malformed in the same manner, all of them having the typical characters of the first family in the complex series. It must be remarked, however, that five other examples of the same family presented essentially the same imperfections, although the placenta was non-adherent, and no traces of morbid adhesions could be detected. It is interesting to observe that the viscera were more or less adherent to the sac in ten of the thirty cases of simple eventration. These circumstances being of considerable importance when considered in connection with the question of the origin of these monsters, I deem it proper to state, that in collecting these cases I have taken into account all those cases, which, from the care taken in describing all, or at least the more particular features in the organization of the monstrosities, can be taken notice of in an inquiry of this kind; and have excluded all those which are merely mentioned as having been seen, without any description of the circumstances connected with their history accompanying the notice.

Isodore St Hilaire, in his work on monsters, states that the greater proportion of the eventrations occupy the right side; this statement, however, does not accord with my researches. In the forty-eight cases above alluded to, I was enabled to determine the position of the eventration, by the aid of the figures

or of the descriptions,—taking, in the latter case, the position of the umbilical cord, or of the umbilical vein, as a clue to the position of the eventration, where no direct mention of the side was made,—and found that no less than thirty-four inclined from the left side, whilst fourteen only, or about one-fourth of the whole number, depended from the right. The parietes of the abdomen were, therefore, malformed nearly three times as often on the left as on the right side. The preponderance of deviations of formation on the left side of the body has long since attracted the attention of anatomists, and has been connected, by Meckel, with the observation that the left half of the body is a less perfectly developed representation of the right, and that, hence, the preponderance of malformations on that side is in conformity with the law that “parts which are but the imperfect representation of parts better developed, or to produce which the formative power seems habitually to employ less energy, are also those which are formed with less constancy.”\*

Another circumstance, which it is necessary I should briefly allude to, is the comparative infrequency of this form of monstrosity among the embryos of the lower animals. From the observations of Otto, Gurlt, and others, it would appear that the embryos of the ruminants, and more especially those of the sheep, are most frequently malformed in this particular manner; but their number bears but a small proportion to the human foetus. It has been remarked, and with a great degree of probability, that malformations, whether by defect or by excess, increase in frequency as we ascend in the zoological series; or, what amounts to the same, that the more perfect and more complicated the organisation of the animal, the more likely is it to present anomalies or variations in its conformation. It would appear, also, that domestication exerts some influence over the production of this as well as other malformations.

Klein† states that the larger number of these monsters present the eventrated viscera at the *os uteri* when labour commences, and that they are forced onwards through the passages with the viscera foremost. It is very probable that this statement of Klein's may be generally correct, but it does not accord with

\* Isidore St Hilaire, in making the statement that eventrations occur more frequently on the right than on the left side of the abdomen, attempts to explain the circumstance by the relation which subsists between the placenta and the liver, through the intervention of the umbilical vein. The liver, however, at the time the eventration occurs, is an almost truly median organ; but, presuming it to be lateral, it would not be difficult to show that the line of traction passing in the direction of the umbilical vein would tend to carry it to the left side.

† Deutsches Archives für Physiolog. t. iii. art. Beschreib. eines. selt. mißgest. Kindes.

the history of the birth of the monsters described by Fried, Cam, Humby, and others.

The larger proportion of these monsters are still-born. Those born alive survive but for a short time after birth, the generality of them living but for a few hours.\* The non-viability of monsters of this class appears to arise from many causes. The very inefficient manner in which the respiratory process is performed, and the loss of the salutary amount of pressure on the viscera, which appears so essential to the due performance of their functions, are undoubtedly the principal causes of their non-viability. The viscera, also, in the complex group present many deviations from the normal type of structure, which render them totally inadequate to carry out the processes necessary for the maintenance of life, at least for any length of time.

The deformity of the trunk and of the limbs is referrible to mechanical causes. The distortion of the limbs being principally in the manner of flexion, is mainly attributable to the permanence of their position whilst the foetus is *in utero*. The imperfection of the limbs is owing to a deficiency in the formative energy in the embryo, and is independent of any influence which may be presumed to be exercised over them by the eventration, as instanced by the thoracic extremities being sometimes malformed and greatly imperfect, or even polydigital, when the eventration is purely abdominal, and by the fact that the extremity opposite to the eventration is occasionally more malformed than that corresponding to it.

The viscera that are imperfect exhibit a persistence of one of their transitory types of structure. It is unnecessary for me to enter into detail on this subject, but I may merely mention that the fact of such malformation, depending on the permanency of a foetal type of structure, and not on the substitution of an entirely new type, was first pointed out by the illustrious Harvey, and has since his time been imbued with a truly scientific character by the labours of Haller, Wolff, Meckel, and others.

(The reader will find a parallel drawn between the cloaca of birds and the cloaca of the second family of monsters, by Geoff. St Hilaire, in the *Dictionnaire d'Histoire Naturelle*, tome viii. article Intestins.)

In inquiring into the cause of the malformation, it is needless for me to enter into detail on the many vague and ingenious opinions, such as the imagination of the mother, the agency of supernatural beings, seeing frightful objects, and the like, which have been advanced from time to time in order to ex-

\* Mercklin mentions a monster which lived eleven days after birth, and Otto one which lived several days. The former case is not sufficiently well authenticated; the latter appears, from the indefinite statement, to be equally uncertain.

plain the origin of this as well as other malformations of the foetus, and which, although considered sufficient to remove all difficulties at the time when they were severally resorted to, have been swept away before the enlightened views acquired from the rapid advance of embryology.

The malformation originates in an arrest of development of the anterior parietes of the trunk; that arrest of development being in strict accordance with the general rule applicable to malformations by defect collectively; namely, that those parts of the organism which are latest in arriving at perfection are those which are most liable to deviate from the normal structure. At an early period, the embryo has the whole or the greater part of the rudimentary viscera contained within the umbilical vesicle and the embryonic expansion of the amnion continuous with the sheath of the umbilical cord; and it is not until near the termination of the third month that the parietes become so completely formed as to enclose the viscera within them. Before the third month, therefore, there is, in some measure, a natural eventration. The persistence of this natural eventration,—of the embryonic type of the parietes of the trunk, and the original position of the viscera,—with such modifications as are necessarily induced by changes in the relative position of other parts of the body, and by circumstances already fully alluded to, constitutes in the foetus a vicious conformation, which is then known as a monster with eventration. All teratologists of the present day are agreed in referring the origin of the malformation to an arrest of development, but are at variance with regard to the primary cause of the arrest of development; some believing that it arises from a vicious condition of the ovum from the period of conception, while others entertain the opinion that it proceeds from some accidental cause supervening during the earlier stages of development.

The most generally received doctrine\* of the present day is that which originated in the philosophic mind of Geoffroy St Hilaire, and has since his time been supported by a great number of those who have directed their attention to the subject. The doctrine holds that this peculiar malformation arises, in common with many others similar to it, during some part of the first three months of embryonic life, in consequence of the am-

\* Other doctrines have been advanced with a much less degree of plausibility, which I may mention. Thus it has been presumed that it, the defective development, arises from an increased size of the liver; or again, from the want of development in those vessels which normally unite in the median line. The former of these opinions is at once refuted by the fact that the liver is not ordinarily increased in size, but, on the contrary, is smaller than usual. The latter, which is supported by Tiedemann, (*Anatomie der kopflosen missgeburten*, p. 105), is contrary to the known laws of development, whereby it is proved that the rudiments of parts are formed before their vessels, and that both always bear a constant relation to one another.

niotic surface of the placenta becoming morbidly connected by adhesive inflammation to the amniotic investment of the vitaline duct, whereby the viscera and their envelopes are retained in their primitive position. This morbid connection between the placenta and the embryo is supposed to act in two ways in causing the malformation; *first*, mechanically, the adhesions keeping up a continual strain on the parts of the embryo to which they are fixed; *secondly*, pathologically, the morbid action inducing some change in the structures attacked by it, which prevents or impedes the normal development of the parts; the former inducing more especially that part of the malformation which is dependent on displacement, the latter giving rise to the arrest of development.\*

The evidence in support of this doctrine is adduced from two sources; from experiment, and from analogical observations, both of which will require somewhat extended consideration, that we might be enabled to determine the true nature of the evidence and appreciate its value.

Eggs were placed, during incubation, in unnatural positions, and the shells were coated in different places with varnish or wax, by Geoffroy St Hilaire,† for the express purpose of procuring positive and direct proofs of the validity of the theory of the accidental origin of malformations by defect generally, from an appeal to experiment. The results that were obtained by him showed that adhesions between various parts of the embryo and its membranes, and even the mode of development of the embryo itself, might be affected at the will of the experimenter, by resorting to the method he employed. Amongst the more successful of his experiments is to be ranked that by which he caused the production of an embryo chick, presenting, according to him, the appearances of a simple eventrated monster. In this particular case, the abdominal viscera were displaced without the abdominal cavity, and had dragged down the heart, which was visible externally, although the greater part of it still remained within the thorax. The viscera themselves presented no peculiarity; but the sternum, according to St Hilaire, did not extend downwards as far as it does ordinarily.

These experiments were repeated by his son, Isod. G. St Hilaire, who has given a detailed account of them in his work

\* For a full exposition of the conditions of this theory, and the evidence by which it is supported, the reader is referred to the original memoirs of Geoff. St Hilaire in the *Philosophie Anatomique*, Vol. ii. and iii., and in the *Memoires du Museum*, Vol. xii.; to the work on monsters by Isodore St Hilaire; and to Dr Simpson's *Observations on the Inflammatory Origin of some Varieties of Hernia and Malformation in the fetus in the Edinburgh Medical and Surgical Journal* for 1839.

† A full account of these experiments will be found in the *Mem. du Mus.*

on monsters.\* As they bear directly on this subject, and, moreover, illustrate the power of resisting mutilation possessed by the embryo, I shall give them at full length. Besides placing the eggs on end during incubation he pursued the following plan. The egg was shaken slightly in the direction of, or perpendicular to, its axis; the shell was covered with varnish, destined to destroy or diminish its porosity; a part of it was thinned at the apex by the application of a dilute acid; another part was removed with a needle or scalpel, and immediately replaced by a very porous substance, the nature of which is not mentioned; and then a superficial or a deep perforation was made by means of a brass, steel, or gold needle, which was either immediately withdrawn or maintained in its place with certain precautions. Proceeding in this way he obtained the following results. The succession of the eggs alone did not produce any very great modification in the development of the embryo; for, contrary to what the experimenter had expected, the chicks were living and exempt from all malformation, but manifestly retarded in their evolution on the twenty-second day after the experiment was performed. In two eggs examined on the twenty-fourth day, he found the chicks well formed in all respects, but presenting a general and very marked arrest of development; they were seemingly dwarfs. One had ceased to live apparently for some days; the death and imperfect development of this embryo had been caused by a portion of a very fine needle which had been allowed to remain within the egg, and was afterwards discovered between the embryo and the shell. An egg, the shell of which had been slightly thinned at the two extremities by the application of a few drops of dilute nitric acid, on being opened, was found only half filled by the embryo, one portion of the vessels of which were black, obliterated, and apparently gangrenous. All the other eggs on which he experimented presented nothing in particular. Many of those into which brass pins had been introduced presented the same appearances as those of an unimpregnated egg; others were in a state of putrefaction. Those into which steel or gold pins had been introduced presented various modifications of the albumen and yolk, which, having no connection with the subject under consideration, need not be noticed.

The only marked effect produced by the experiments of the two St Hilaires, with the exception of the total annihilation of the embryo, is a general defect in the formative energy by which the embryos were not malformed, but merely prevented from attaining their usual size. Indeed, if we also except the chick

\* Vol. iii. page 503, *et seq.*

with an apparent eventration seen by the elder St Hilaire, no decided results have been obtained from the many attempts that have been made from time to time to induce malformations by defect, by acting mechanically on the eggs during development. Even the appearances presented by the chick before alluded to are very dissimilar from those which characterize a true eventration; thus, there was no malformation of the viscera, no distortion of the trunk, and no imperfection or deformity of any part of the body but the abdominal parietes. Reviewing the facts before us, we cannot help arriving at the conclusion that the experiments hitherto performed are undecisive, and in no way applicable to the explanation of the primary cause of monstrosities with eventration. Isidore St Hilaire allows that the results obtained, both by himself and his father, are negative, and cannot be held to conform with the conditions of the mechanical theory as applicable to this and other forms of malformation by defect.\*

Observation shows that the malformation and adhesions between the abdomen and the placenta are occasionally associated, but does not appear to have proven that the former is a consequence of the latter. It is true some forms of malformation by defect, and others by displacement, have been shown by different observers to be referrible in the first instance to morbid adhesions contracted between the foetus and the placenta, or between one part of the foetus and another. Amongst such might be mentioned the imperfect development of the limbs, (so called spontaneous amputation), occasionally met with in the human foetus, which have been proved by the observations of Drs Montgomery and Simpson to be the consequence of the mechanical action of bands or rings of lymph effused during development; and congenital hernia, more especially congenital inguinal hernia, which, according to the researches of Dr Simpson, is occasionally the result of morbid adhesions contracted between the intestine and the testis, whilst the latter is an abdominal organ.† These and other observations of a similar nature indicate that where the placenta is attached to the abdomen of the embryo, or where the viscera or peritonæum are more or less adherent to the amnion, the eventration may be primarily induced by accidental causes, that the parietes and the viscera may have attained to a certain degree of development, and the subsequent changes which take place in them

\* And Dr Thomson, who has repeated the experiments, informs me that although the results show that the foetus is under the influence of mechanical causes, yet the malformations induced by such experiments differ widely from the well known malformations which come under the notice of the teratologist.

† Edin. Medical and Surgical Journal, Vol. lii. p. 17, *et seq.*



before they arrive at perfection, have been arrested by a mechanical or a pathological cause.

I have already pointed out the comparative infrequency of placental adhesions in this group of monsters, scarcely one-fifth of the whole number of authentic cases presenting that peculiarity; and I have alluded to the curious circumstance that such adhesions appear to be always associated with one particular form of the malformation and not with all. Now, without acquiescing in the opinion advanced by Dr Simpson,\* one of the most zealous supporters of the mechanical theory, that all kinds of the malformation are referrible to morbid adhesions of the embryo to the placenta or membranes of the ovum for their cause, although such adhesions might be non-visible afterwards in consequence of having been ruptured during the process of parturition, or during the course of intra-uterine life, or in a still less feasible supposition of Geoffroy St Hilaire's,† that where placental adhesions are not found, the malformation is owing to an hypothetical adhesion of the allantois to the amnion, both of which opinions are unsupported by facts. I am inclined to admit that the malformation in the first family of the complex group may probably be sometimes caused by the adhesion of the embryo to the placenta; and moreover, that some of the monsters with simple eventration may have their origin in morbid adhesion of the peritonæum or some of the viscera to the amnion, although the supporters of the mechanical theory have not yet claimed them as their own. At any rate, until we are enabled to show, by repeated and accurate observation, how much of these morbid connections is the result of some pathological action induced by the eventration itself, we must deliver over those cases, which amount to little more than one-third of the whole, to the supporters of the mechanical theory.

In conducting inquiries of this kind, sufficient attention, as it appears to me, has not been hitherto paid to the question, whether adhesions of the viscera to the amnion, or of the placenta to the embryo, are not the effect rather than the cause of the malformation. The circumstance of the adhesions of the placenta to the embryo being "seen" in one family only, and of others of the same family being constructed in essentially the same manner without the slightest trace of adhesion of any kind being visible, goes far to prove that the position of the eventration may, in some cases, induce inflammatory action, and thus may be accidentally united to the placenta. The highest form of the malformation that has yet been observed,—that which

\* Edin. Med. and Surg. Journ. Vol. xlv. p. 306.

† Mem. du Museum, Vol. xii. page 247, *et seq.*

is described by Otto, and is constituted into the fifth family in my arrangement,—as well as others of a different kind, have been most undoubtedly caused without any adhesion between the embryo and placenta, or viscera and amnion, or any appreciable mechanical or pathological cause, and must be referred to some original unnatural conformation or condition of the ovum for their production. Hence, why may not the others have originated in a similar condition of the ovum, the pathological action and its consequences arising as a result of the malformation, and being dependent for its origin on some circumstances, the exact nature of which has not yet been ascertained? This question requires either an affirmative or a negative reply before it will be possible for the teratologist to arrive at any satisfactory general conclusion respecting the more immediate cause of the malformation.

The primary cause of the malformation, therefore, remains an open question, requiring much further investigation before it can be satisfactorily resolved. Still, the evidence derived from the history and organization of the monsters themselves, which seems to lead to the almost certain conclusion that the malformation originates in a primitive unnatural condition of the ovum, although what that condition of the ovum is, or what its cause may be, remains a problem, must not pass unnoticed. To enter fully into all the circumstances that may be adduced in favour of the view, that monsters with eventration are of original formation, would amplify the already too extended limits of this paper, I shall therefore simply enumerate the facts which appear to be the most convincing.

1°. The whole group of monsters with eventration form collectively a complete series, the extremes of which are united by intermediate forms. This series is not composed of an infinite series of forms; on the contrary, it is limited to a few, which are constantly recurring. Again, the structure of these monsters is not extremely varied, but defined, and admits of their being arranged according to the principles usually employed in making a natural classification. Most of the monsters in this arrangement are observed to be typical of the family to which they severally belong, whilst those which deviate from the typical form serve to unite neighbouring families, and complete, to a great extent, the circle by which the most simple and the most complicated examples of the malformation are connected.

2°. The malformation of the parietes in all, and of the viscera in the complex group, is in strict conformity with a general law, which, although differing in the terms used in expressing it, is identically the same as that which regulates the frequent in-

clination of the eventration to the left side, the energy employed by nature in forming these parts being, for the most part, visibly backward and tardy.

3°. Moreover, although monsters with eventration, and more especially those which present the most marked defect in the development of the viscera, are usually otherwise greatly malformed by defect, as, for instance, in the cranial and spinal parietes, and in the extremities, yet they often present, in conjunction with these malformations by defect, others by redundancy, and that even in those cases where the placenta is adherent to the embryo, or the viscera are attached to the embryonic portion of the amnion. The supernumerary *appendix vermiformis*, and the enlarged *lobus Spigelii* of the liver are here more particularly alluded to.\*

These circumstances, taken either singly or collectively, tend to preclude the idea that accidental causes can possibly have led to the production of such a complete teratological family, however varied these accidental causes may be presumed to be in their nature and mode of duration.†

As already stated, the mode of origin of these malformations still remains a problem to be solved only by much patient and accurate observation. Seeing the impossibility of arriving at any satisfactory conclusion on the point in question, I have purposely refrained from arguing it to any extent, and have confined myself principally to the simple statement of the facts and arguments which may be adduced in support of either of the views entertained by teratologists at the present time. In connection with this, I would remark, that, although thoroughly convinced of the primitive origin of the greater number of the monsters of this class, I am far from supposing that all of them originate in an unnatural condition of the ovum; on the contrary, I am inclined to admit that accidental causes, and more especially adhesive inflammation, may induce an arrest of development in the parts influenced more directly by it, after those parts have been evolved to a certain extent; that a complex eventration may result from the embryo being morbidly connected to the placenta, and a simple eventration from the viscera or the peritoneum being adherent to the embryonic portion of the amnion. The facts already acquired concerning the organization and pathological phenomena presented by

\* This last circumstance at once refutes the accidental theory, since it is impossible to reconcile it with the existence of defective development, where a mechanical cause is the only agent in inducing both at one and the same time, and in a part of the same system.

† The reader is referred to Meckel's *Historia Monstrorum Nonnullorum*; a work written expressly for the purpose of refuting the mechanical theory as advanced by St Hilaire, for a complete account of the evidence in favour of the primitive origin of malformations by defect.

these monsters, which facts I have attempted to arrange in a systematic form in this necessarily imperfect notice, may probably assist those who take up the subject hereafter in their researches, and may tend to lead to the determination of the much disputed question.

March 1847.

### *Description of the Plates.*

#### PLATE XII.

The eventration is seen depending from the left side of the abdomen. The sac having been removed.

1. The body of the liver.
2. The enlarged *lobus Spigelii*, projecting forwards from the liver, between
3. The stomach, which is seen slightly raised from the abnormal position described in the text, and
4. The pancreas, the splenic extremity of which is found broader than the duodenal.
5. The intestines, the puckered appearance of which is well delineated.
6. The left kidney.
7. The spleen, having a somewhat lobulated appearance.
8. The penis; the prepuce being somewhat enlarged.
9. The gall-bladder, in its collapsed state.

I must apologise for this imperfect figure of the anatomy of this monster. Several drawings were made of different dissections of the parts, but were unfortunately lost.

#### PLATE XIII.

1. The liver.
2. The *lobus Spigelii*, somewhat enlarged, and detached from the liver.
3. The stomach, placed below the *lobus Spigelii*, in order to show that lobe.
4. A small portion of the pancreas.
5. The small intestine, even more puckered than in the preceding monster.
6. The left kidney.
7. The spleen.
8. The oval depression, indicating the position of the glenoid cavity.

#### PLATE XIV.

Fig. 1. Structure of the external membrane of the sac, which exhibits the epithelium (*a*), the germinal membrane, with the germinal spots arranged in parallel rows (*b*), and the areolar texture (*c*), characteristic of a serous membrane.

Fig. 2. Exhibits the heart and larger blood-vessels taken from the second monster described in the text.

1. The incomplete ventricular septum, the ventricles communicating freely over its semilunar border.
2. The sinus, or *bulbus arteriosus*. The three semilunar valves with which it is provided are figured.
3. The pulmonary artery arising from it and immediately dividing into its two branches. The aorta is the main continuation of the bulb.
4. The lung.

Fig. 3. Exhibits the arrangement of the bones in the right arm of the same monster.

1. The scapula articulating with the single bone.
2. Which represents the ulna, radius, and humerus.
3. The cartilaginous nodule representing the carpus.
4. A metacarpal bone.
5. The three phalanges.

ART. III.—*Report upon the Contagion of the Plague, &c., with an Appendix.* By JAMES LAIDLAW, Member of the Royal Colleges of Surgeons of London and of Edinburgh, and Surgeon to the General Hospital for Europeans at Alexandria, Egypt.

For it is the custom of mankind, nay, even when their own country is concerned, to acquiesce with ready credulity in the traditions of former ages, without subjecting them to the test of sedate examination.—THUCYDIDES, Book i, page 16. *Smith's Translation.*

*Alexandria, June 1839.*

MANY apologies are necessary for the appearances of hasty composition, which will readily be detected in perusing the following report. The excuses I have to offer are, the shortness of the time which could be allowed for its preparation, when the importance of the subject imperatively demanded that nothing should be advanced without the most serious and deliberate consideration;—this, and the many and constant interruptions to which every medical practitioner is continually liable, and to which I am by no means an exception, is all I have to offer in defence of the style. With regard to the opinions I have advanced, I may be allowed to say, that I have been in the habit of thinking upon this subject for a number of years, and that, fully aware of the solemn nature of the duty imposed on me, I have been anxiously careful not to bring forward any opinion which my experience did not fully justify, nor to state any circumstance, the facts of which had not come under my own observation. (Signed) JAMES LAIDLAW.

*Report upon the Contagion of Plague.*

Before entering into an examination of the questions,\* it is necessary to point out, what is understood by the word “contagion,” as applied to the disease called plague, in order to avoid that confusion which is often caused by the ambiguous usage of the expression. With this purpose I shall review, as briefly as possible, the assumptions upon which lazarettoes and

\* The questions here referred to, are the seven questions circulated in February 1839 by the agents of the British Government, as formerly stated, among physicians settled in the Levant. See Medical and Surgical Journal, Vol. lxviii. p. 217.

quarantine regulations have been established, and sanitary laws enacted and enforced with no ordinary severity.

Among the Christian population in the Levant, and by all European nations (the Turks alone excepted) having ports in the Mediterranean, the general belief as to the propagation of plague is, that the nature of the disease is such, that it can only be conveyed from individual to individual by positive contact or touch, either directly with the body of the diseased person, or indirectly by what are called "susceptible articles;" and that a person in health may remain for any period, and even sleep in the same room with the diseased, and will undoubtedly enjoy perfect immunity, provided he avoids all contact with the diseased, or with infected goods or furniture. This doctrine is carried to various extremes of refinement, particularly in lazarettoes and quarantine establishments, where the assumptions of danger are often of so ridiculous a character, that if it were not for the vexation they occasion, they would be scarcely worthy of serious consideration.\* It is further believed, that what are called "susceptible articles," having been in contact with diseased persons, or having been handled by persons who have been so in contact, or having been in contact with other articles which have been so exposed, and so on through various degrees of exposure or contamination, may be, and very frequently are, impregnated with the virus, morbid matter, or effluvia, from the body of the diseased person, and that they can retain it for a very long period, so as to be packed up and transported to countries far distant and after long voyages; countries totally different in climate—the seasons the most opposite—the habits of the people and manner of living as opposed as the extremes of refined civilization and the rudest barbarism; that after being thus transported, they are capable of giving the disease to whoever come in contact with them; and that thus this malady has been carried from country to country, until the establishment of quarantine regulations and sanitary laws put a stop to its devastations.

Whenever the plague has appeared in Europe since the first establishment of quarantines, the authorities, acting upon the above assumptions, have always endeavoured to trace out the channel by which it was imported; and certainly they are entitled to the public approbation for the zeal and activity with which their investigations have been carried on; and I am not aware of any one European plague which has not been accounted for by a breach of the quarantine laws. It must be remembered that this breach, it is supposed, may be equally effected by the evasion of quarantine in conveying a letter

\* See Appendix (1.)

clandestinely on shore without previous smoking, as by a whole package or bale of susceptible goods; and it has even been asserted, that a ring wrapped in a little cotton and sent from a lover to his mistress, has been sufficient to spread the disease to a whole district, and cause the loss of thousands of lives.

These dogmas are received with such implicit confidence, and regarded with such superstitious reverence by the Christian population of the Levant, that not to adopt the supposed means of safety by keeping a strict quarantine during the existence of the disease in the country, is considered little less than impiety. The parent who neglected the safety of his family by a breach of the quarantine regulations would be regarded with more horror than he who, when his child was attacked with the disease, abandoned it to its fate and sought only his own safety. Every family considers itself perfectly secure, let the locality be where it may, so long as the quarantine is perfectly kept by all its members; that is, that they confine themselves to their dwelling, and never admit any susceptible article into the house without previously smoking and purifying it; no one ought to be allowed to go into or pass out of the house, and the greatest attention is paid that no susceptible materials, such as feathers, flocculi, or other light articles, are borne in at the windows.

I am not aware upon what data or authority the precise articles or goods, which are considered susceptible of receiving the contagious matter of plague, have been so arbitrarily fixed. I am perfectly at a loss to conceive upon what philosophic principle susceptibility or non-susceptibility has been so clearly defined. All substances which are bad conductors of heat appear to be considered as the most highly susceptible, such, for instance, as wool, silk, feathers, flax, &c. All powerful conductors of heat, on the contrary, are considered non-susceptible, as metals, glass, ivory, wood, &c. One would be led to imagine, from the regulations on this point, issued by quarantine boards, that they were the result of experiment and experience, rather than what is urged by the opponents of the system, the dictation of mere caprice.\*

Having thus endeavoured to point out what is meant by contagion in plague, I shall proceed to the examination of the question.

1st, As to the propagation of plague by contagion and contagion alone.

\* Dr Mead has attempted an explanation of the manner in which goods can hold and retain "the matter of contagion," by drawing an analogy between the power which soft and porous bodies, and especially substances of the "animal kind," such as furs, feathers, silk, hair, wool, &c., have of retaining the odour of perfumes, and the manner in which he supposes they retain, if kept close pressed, the virus of the plague.

2d, As to the propagation of plague by other means than by contagion, and as to its infectious character.

3d, As to the possibility of substances which have been in contact with plague patients, communicating the disease to persons in health.

4th, As to how long the infection of plague may lay dormant in an infected person before it declares itself by evident symptoms.

5th, As to the virus or morbid matter of plague lodged in inanimate substances, and the manner of purifying such substances.

If the disease called plague were propagable by contagion and contagion alone, it is hardly possible to conceive that a medical man could reside for several years in a country where it is constantly appearing, without meeting with many instances, occurring under his own personal observation, where the disease was so directly conveyed from one person to another. It has long been allowed by all medical men, that the contagion or infection of known and indisputably contagious diseases, can be conveyed from the houses of the infected to those of the healthy, and we have a right to suppose that if the plague possessed the same property it would come as frequently under our observation and be as self-evident. One would imagine that when the disease is raging and carrying off hundreds per diem, we shall have a case or two occasionally where the individuals could give some reasonable account of the manner in which the disease was conveyed to them. We should have some intelligible account of a person coming from an infected quarter being admitted into a family, and, as would most likely happen with small-pox or measles, communicating the disease to some of the members; yet, notwithstanding the universal belief in contagion, not a circumstance of this nature has come to my knowledge. Whenever I asked my patients how they had contracted the disease, I was either told some nonsensical story founded upon supposition, such as having touched a piece of paper supposed to have been infected, or an infected cat having been, or supposed to have been in the house, or having been in contact with some person who had not kept a good quarantine, and who might have given them the disease (though he did not take it himself), and many other absurdities founded upon the belief in contagion and contagion only, as the means of propagating the disease.

On the other hand, I have had numbers of instances under my own eye, where persons have been attacked with the disease, and have been as directly as possible in contact with persons in health, and the disease has not been communicated.



It has not spread its devastation in the family; those who nursed the sick have remained unharmed; those who buried the dead unaffected. I have seen the daughter throw herself, despite the supposed danger, upon the corpse of her deceased mother, and remain embracing the lifeless body, till torn away by the attendants. I have seen a father holding his dying child covered with pestilential petechiæ in his arms, and never quitting it till separated by death.\* I have often and often witnessed the indifference with which the Arabs and Turks place themselves in contact with the diseased and escape unharmed. I have placed people in contact with the diseased as a necessary part of my duty at the hospital, and have never been able to detect any communication of the malady. I have myself personally been in contact and communication with a number of persons labouring under the disease, and in attending them have always performed all the duties of the medical attendant in precisely the same manner as in cases of ordinary disease, bleeding them when necessary, opening their buboes, &c., and on one patient performed a most important surgical operation, and still I have avoided the stroke of the malady.†

It is not when the plague rages only as an epidemic that we have the opportunity of investigating its nature and inquiring into the phenomena which attend its fatal progress. Throughout the whole extent of the Turkish dominions occasional cases occur from time to time;—it is then said in medical language to occur sporadically. These cases occasion no alarm to the Turks, and experience has shown us that they are unattended with any danger, so far as communicating the disease is concerned. It is a circumstance of frequent occurrence in the Levant, that an individual is attacked with plague when there is no epidemic; and these cases breaking out in the heart of a town or village go through their course,—no one else is attacked, although numbers are in contact directly or indirectly with the individuals; and if it were not for the alarm, which is sounded by the quarantine officers, who assume the danger, no one would imagine that any thing of importance had occurred. I have had an opportunity of watching many of these cases, and I have no hesitation in declaring that in no

\* See Appendix.

† It is curious that Procopius takes notice of the same circumstances in the plague of Constantinople. "And their attendants (says Procopius) worn by constant labour, suffered most severely, insomuch that men pitied them no less than those that were ill; not from any dread of contagion (for no physician nor other person fell sick from contact with the sick or dead; since many employed constantly in nursing or burying against all expectation survived this service, and many for whose illness no cause could be discovered, died at once). But on account of their hard labour did they pity them."—*Procopius de Bell. Persico*, B. xi. c. 22, 23.

case has the disease been communicated to another individual. A sailor on board an English ship in the port of Alexandria, and which had come last from England, I have seen attacked with the plague when there was no disease in the town, and it was quite impossible he could have caught it by contact; he was in free communication with the crew, and slept among them after he was taken ill for several nights, and no one was afterwards attacked. I have seen similar cases occurring in private families, where one person only was the victim, and all the relations and friends escaped. At the hospital I have repeatedly had patients under the same circumstances, and in no case have the attendants, or other persons who were necessarily in contact, been attacked.

Now, when we come to the conclusion to be drawn from all these circumstances, when we reflect upon the total absence of all positive evidence on the side of contagion, and when we consider that the results of our experience and investigation show, that the disease in question does not follow the laws of known contagious diseases, are we not justified in at least offering a conjecture, that contagion in plague is an assumption grounded upon superstition, handed down to us from the dark ages, and that it is a remnant of that obscurity in which science was for so many ages involved ?\*

2. The question next to be considered is the infectious nature of the disease, or the property which it is supposed to possess of being conveyed from man to man by other means than contagion. After what I have said upon the subject of contagion, it may appear to require very little space for the observations I have to make upon this question, inasmuch as every person who has been in contact with a diseased person must necessarily have been also within the sphere of infection. I hope I shall not be accused of frivolously drawing lines of distinction between contagion and infection, these terms being not unfrequently used as almost synonymous. It is to be remembered that I am writing upon this subject with reference to the efficiency of quarantine establishments, and that it is maintained by the supporters of that system, that there is no danger to be apprehended from plague, except by direct personal contact either with infected persons or goods, and that persons in health may with perfect safety approach the diseased within a distance of only a few feet, so long as they avoid personal contact.

In considering the question of propagation by contagion, I have stated as the result of my experience that persons about

\* See Appendix.

individuals suffering from the disease are not attacked, as is generally supposed ; and that, on the contrary, the general rule is that they escape without injury. Now this is just as applicable to infection as to contagion : but yet I do not think I am warranted in saying that under no circumstances and in every locality, the disease cannot be communicated from individual to individual. To explain this more clearly, let us suppose a person attacked with plague during an epidemic, living in the dirtiest, least ventilated, and undrained quarter of the town, in a small apartment which serves to accommodate a whole family ; let us suppose the usual practice of the Levant to be adopted, and as little light and air admitted as possible ; let the disease assume the form of the most malignant typhus, and the family still live in the same room exposed to the respiration of this polluted atmosphere ; and I think it more than probable that many of them would be visited with the disease ; and the same system might be continued till they were all exterminated.

This is not an exaggerated picture of what constantly takes place in the east ; and when it is considered that of the thousands of victims cut off by every epidemic, nine-tenths of them lived in small mud huts only a few feet square, and so low that no adult could stand erect in them, and the only means of ventilation afforded is by a door just sufficiently high to admit the owner crawling in upon his knees ;—when it is considered that personal cleanliness is totally neglected, and poverty and the most abject wretchedness stand in the place of the most humble comforts ;—when thousands have no place of repose but the bare ground, and the coarse and scanty garments which serve for clothing during the day are the only materials with which to protect themselves from the severity of the night ;—when the food, which these poor wretches can only obtain in meagre allowance in proportion to their wants, is of the coarsest and most unwholesome description ;—should it be any longer matter of surprise that a pestilential disease should arise, and that it should spread to all around with dreadful malignity ?

It would not be unphilosophical to conjecture that from these causes originated the disease, and that such might be the manner in which it is propagated ; but experience has shown us, that they cannot alone account for all the phenomena which attend the rise, progress, and extinction of this particular pestilence. If the plague depended for its origin upon a particular season of the year, we should expect it to return in a greater or less degree every year at the same season ; but as this is found not to be the case, and it often happens that what is called the “ plague season ” passes away without

the occurrence of a single case, it is conclusive that it does not entirely depend upon that circumstance. Yet it is worthy of remark, that an epidemic plague in Egypt has never been known to occur except at one and the same period of the year, during certain particular months, and that it as certainly disappears as an epidemic, by or before the summer solstice. The fact is so well known in the country, that the termination of the epidemic is predicted with confidence, and the most timid contagionists do not hesitate to break up their quarantine. It appears to me, therefore, a matter beyond dispute, that the influence of the season, let it be upon the atmosphere, or upon the earth, or what it may, clearly influences the arrival and departure of the disease, but does not produce it.

If the existence of the disease depended wholly and solely upon either contagion or infection, it could never cease in a country where, among the great body of the people, total disregard for all precaution existed,—where there was continual intercourse between the sick and the healthy,—where the habits of the people are such that they are peculiarly predisposed to the reception of contagious disease,—and where the want of ventilation and drainage, the habit of constantly congregating together, wearing each others clothes, and the promiscuous sale of the effects of the dead, would afford every facility to the spread of the disease. If the disease originated in one person or individual, and was spread around by contagion or infection, how could it possibly cease all at once when the persons and property of thousands had been contaminated? By referring to the table in the appendix, it will be seen that in the month of December 1834, 93 deaths from plague occurred in Alexandria; in January 1835, 140; in February, 793; in March, 4251; in April 1912; and in May, 262; making a total for these six months of 7451 deaths alone; and if we allow the moderate computation of one-fifth as the proportion who recovered, we have a total of infected during the six months of 9313.

Here we have, in a comparatively small city, during the short period of only six months, upwards of 9000 persons affected with a disease said to be highly infectious and propagated with great facility, and yet all at once the disease totally disappears, and is, as it were, extinguished. The number of deaths during the last week of May amounted to only four, and this at a time when there were more infected houses and goods than there had ever been before; but in the first week of the previous December, when the disease was only beginning to appear, we had twenty-two deaths;—so that we abso-

lutely had less plague in the city after the raging of the epidemic than at the commencement. Now this could not have happened had the plague depended on contagion or infection for its propagation; the disease must have gone on all the year round, instead of going away entirely; and if it was arrested by the approach of summer, how is it to be explained that we had no epidemic the next year at what is considered the most genial season?

After what I have said above I hope I shall not be misunderstood. I do not deny that the plague can be communicated from man to man by infection, but I see no ground whatever for concluding that its being so communicable is the cause of the disease spreading epidemically. During the many years I have resided in Egypt, I have never seen the disease spread in such a way that the infection could be clearly traced either in sporadic or epidemic cases, and I do not know of any case where it has been communicated to the attendants; and this is quite the reverse of what happens in known contagious diseases. But before I proceed to the conclusion of this division of the subject, I must point out one circumstance connected with the question, which I particularly remarked during the plague of 1835, and which may materially assist us in the investigation.

Whenever any great number of persons sick with plague are congregated together in one locality, they seem to create a pestilential atmosphere, if the ventilation is not particularly attended to. At the lazaretto at Alexandria in 1835, to which all the early cases of plague were removed, notwithstanding all the quarantine precautions, which were rigidly observed, every officer belonging to it was attacked with the disease. At the government cotton stores the plague raged with great fury among the natives employed at work there, and the same circumstance occurred as at the lazaretto; almost all the Europeans who were employed also contracted the disease, notwithstanding the most strict observance of quarantine regulations. At the European hospital, to which all the poor Europeans were sent when attacked, the same phenomena presented themselves. The surgeon, assistant-surgeon, the steward, the apothecary, and the infirmary man were all attacked with the disease within a very short space of time. Of these five persons, three observed the strictest quarantine, and two communicated freely with the patients; yet the result was the same to all. It is only, however, when very large numbers of sick are assembled together that these circumstances present themselves, and only then when free ventilation is impeded, and which of itself is

sufficient to generate disease. From some extraordinary delusion, it is the custom in the Levant to exclude, as much as possible, the air from the chamber of the sick, and I have frequently been to visit plague patients where the impurity of the atmosphere was so remarkable that I was under the necessity of making my visit as short as possible.

What are the conclusions we are to draw from a comparison of these circumstances? In private houses where ventilation is good, the disease, as a general rule, is confined to one individual alone; whenever a number of persons are assembled in a confined atmosphere, and no attention is paid to ventilation, and the disease appears, every one is cut off; are we not led to conclude that, under certain circumstances, the exhalations from the bodies of the sick are sufficient to contaminate the atmosphere and convey the disease from the sick to the healthy? but, at the same time, it does not follow that the disease, originating in the persons of one or two individuals, can be propagated by them to such an extent as to assume the character of a general epidemic:—1st, because the progress of the disease is always arrested at a particular season of the year, and could not, I believe, be made to continue by any human ingenuity, and, consequently, we have a right to assume it depends upon the season of the year, in some measure, for its existence and propagation; and, 2d, because from the non-appearance of the disease during a great many of these seasons, we can only conclude that its existence and raging epidemically, must originate in some peculiar modification of one season in particular, and which does not exist in others.

I believe it has been admitted by almost every writer upon the subject of the present investigation, who had personally examined the phenomena of the disease, that it is necessary for the full development of every epidemic, that a certain predisposing condition of the atmosphere should exist, and that without such a predisposition, a few sporadic cases of plague occurring would be unattended with any danger.\* Upon

\* See Sydenham, page 61, edition 1697, who had personally treated the disease, and was a practical man. The general conclusions to be drawn from his observations and opinions are, that he believed the plague to be propagated by infection; but that it was necessary that there should be, at the same time, a pestilential constitution of the air to render the disease epidemic; he considers sporadic cases communicable by infection, which my experience, however, does not confirm. He does not attempt to explain the nature of the pestilential constitution of the air, but quaintly remarks, "But what that disposition of the air is from whence this morbid furniture proceeds, we know not, nor many other things, which the doating and arrogant crew of philosophers trifle about."

Dr Mead, who wrote in 1720, follows the same opinion generally, though a warm advocate for the principle of contagion and infection; he says, "The body, I

what this condition of the atmosphere, which so evidently influences the duration of the epidemic, depends, is as much a mystery as it was centuries ago, and it does not appear probable that it will ever be satisfactorily explained. Yet no one who has had experience in the countries where the disease occurs from time to time, ventures to deny that such an inexplicable cause must exist in order to account for the appearance and disappearance of an epidemic. Let this be once admitted, and I think we may come to the following conclusions without risk of incurring the charge of rashness and presumption.

1st. That it is not essential to the existence of an epidemic plague that there should be absolute communication by contagion or infection between the sick and the healthy, but that the wide extension of the disease is rather to be attributed to some atmospheric influences which we do not understand.

2d. That persons affected with the disease, in some of its forms, can communicate it to others in health, who are exposed to the morbid effluvia or exhalations from their bodies, but that this communication does not generally happen except dur-

suppose, receives them (the pestiferous atoms) in two ways, by the breath and by the skin ; but chiefly by the former." Dr Mead always, in speaking of the epidemic disease, lays great stress upon a "corrupted state of air;" and on one occasion remarks, that "although the air be in a right state, yet a sick person may infect those who are very near him;" but adds afterwards, that in this case the malady does not usually spread far, the contagious particles being soon dispersed and lost. (See MEAD'S *Discourse*, p. 66.) It does not appear that Dr Mead ever saw and treated a case of plague, and he has evidently been much imposed upon by his informants.

Dr Russell, who had ample opportunity of investigating this disease at Aleppo, during the years 1760, 1761, 1762, and who has written a most voluminous work upon the subject has adopted all the prejudices of the Levant ; yet he, like most other writers, lays great stress on "the pestilential state of the air" during an epidemic, and observes, (page 251), "In what this particular constitution of the air consists, whether it operates by heightening the powers of the infectious effluvia, or by inducing an epidemical change in the human body, whereby it is rendered more or less susceptible of, or enabled to resist their influence, the effluvia remaining the same, are points involved in much obscurity. It seems, in the meanwhile, incontestable, that without a concurrent state of the air the plague will not become epidemical ; and without a certain disposition of the body, the infection will not take effect."

The only author with whose writings I am acquainted, who goes headlong to the point, and will admit of contagion, and contagion alone, as the means by which the plague is propagated, is Mr Tully, who had some experience in the plague of Malta in 1813, and I believe subsequently in the Ionian Islands. This gentleman sets all former authorities and modern experience equally at defiance, and will not allow that the condition of the air has anything to do with the disease. (See TULLY, *History of Plague*. London.) I should not have considered it necessary to have alluded to this gentleman's very peculiar opinions, had I not lately seen in an account of what has been called the "Pali Plague" in India, that the system of quarantine recommended in the work above referred to had been adopted for the purpose of keeping the disease within bounds, and had been singularly unsuccessful.

ing the existence of that peculiar state of the atmosphere alluded to above.

3d. That supposing such a state of atmosphere to exist in any particular locality, we have every reason to suppose that the disease would there break out, notwithstanding every sanitary precaution was adopted, and, as experience has shown us, would disappear as soon as a more salutary state of atmosphere supervened.

3. We now come to one of the most important points of our investigation, and have to inquire into the *possibility of substances which have been in contact with plague patients communicating the disease to persons in health*. This question is of paramount importance, inasmuch as it comprises not only the possibility of conveying the disease from person to person by means of infected goods or wearing-apparel, but it also includes the far more important consideration of the possibility of goods and merchandize becoming so impregnated with the miasmata, morbid matter, or effluvia from the bodies of the diseased, as to be capable of conveying the disease to persons in health after voyages of considerable length. It is, therefore, particularly essential that in examining this part of our subject, we discard theory, and confine ourselves as much as possible to the investigation of facts, and that, in drawing our conclusions, we endeavour to found them upon evidence which will admit of the least possible doubt.

With regard, then, to the first point in the inquiry, namely, "as to the possibility of conveying the disease from person to person by means of infected goods and wearing apparel," I am not prepared to deny that, under the circumstances influencing the communication of the disease by infection, such a communication may be possible; but so far as my own experience goes, I have no evidence to offer that such does actually take place. On the contrary, I have frequently had occasion to remark the immunity with which persons in health have handled the bedding, clothes, and other articles, which have been for many days together in the closest possible contact with diseased persons. I have known a person sleep under the coverlid taken from the bed of a person labouring under plague without taking the disorder.

Among the natives, the clothes of persons who have died of the disease are never thrown away by their relatives, but are either preserved for use, or are sold in the bazaar, and consequently, if we admit the possibility of this mode of communication, we must admit also that it is necessary some other circumstances be conjoined with it to allow of its taking effect,



or we should never see the disorder arrested, and a total cessation for a period of years would be an absolute impossibility.

The second point which we have to consider is, the possibility of goods and merchandise being so contaminated in an infected port as to be capable of conveying the disease to other countries when unpacked and handled by persons in health. To this subject I have devoted very particular attention, and have diligently examined the evidence in favour of the supposed importation of almost every European plague of which we have any record.\* These histories are compiled from the most vague assertions, and often unsupported by a tittle of evidence. It is difficult to detect a ray of truth among the clouds of fable with which they are crowded; they are calculated to excite alarm among the timid, and to add the horror of desertion of the sick during the period of pestilence, to the evil which cannot be averted. It is not, however, my purpose, in the present paper, to enter into an historical examination of the subject, but to record such facts and observations as have come within the space of my own experience.†

During the plague of 1835, which preserved its epidemic character from the beginning of January till the commencement of June, and during which period, as I have stated above, upwards of nine thousand persons in the town of Alexandria alone, must have suffered from the disease, vast quantities of cotton-wool were embarked on board British merchant-vessels and sent to England. The cotton so embarked was taken from the government cotton stores, where the plague raged most fearfully; it was pressed on board the English vessels, so as to render it convenient for stowage, by the crews, assisted by working parties of Arabs, who came from the shore and who returned home to sleep; there was nothing like a quarantine observed by any of the English captains, and the English sailors were constantly at work at the cotton store, shipping off the bales in their boats. In fact there was the most perfect communication and contact which any reasonable

\* For a most masterly and logical examination of this subject, see *An examination into the Laws of Pestilence*, by Dr HANCOCK. London, 1825.

† I may perhaps be excused the insertion of a story from no less an authority than Dr Mead, which will serve as an illustration of the above observations. "A very remarkable story," says the Doctor, "lately communicated to me by a person of undoubted credit, is too much to the purpose to be here omitted. The fact is,—In the year 1726 an English ship took in goods at Grand Cairo in the time of plague's raging there, and carried them to Alexandria. Upon opening one of the bales of wool in a field, two Turks employed in the work were immediately killed, and some birds which happened to fly over the place dropped down dead." (See MEAD, page 89.)

experimenter could have desired, and no precautions, no fumigations, no airings were adopted; the cotton was stowed away in the holds of the ships, screwed into as small a compass as possible, the hatches closed, and thus it was conveyed to England. In some of the ships the plague broke out among the crews during the time they were loading, but the work of stowing the cotton went on notwithstanding; communication between the infected ships and those which had no sickness on board was unrestricted, and the disease did not spread to any extent among the former, nor was it communicated apparently to the latter. The exportation of cotton-wool from Alexandria during the year 1835, amounted to 98,502 bales, all of which was sent to Europe in the following proportions :

|                |               |                  |            |
|----------------|---------------|------------------|------------|
| To England,    | 31,709 bales. | To Leghorn,      | 424 bales. |
| To Marseilles, | 33,812 „      | To Holland,      | 150 „      |
| To Trieste,    | 32,362 „      | To sundry ports, | 45 „       |

A bale of Egyptian cotton consists generally of about 200 lbs. weight.

The English vessels which cleared out from Alexandria, with cotton cargoes on board, for England, during the same year, were in number about twenty-five; namely the

| Date of clearance. |          |    | Date of clearance. |           |    |
|--------------------|----------|----|--------------------|-----------|----|
| Hero               | January  | 18 | †Newham            | June      | 9  |
| Beatrice           | February | 28 | Arion              | June      | 23 |
| †Pursuit           | March    | 13 | Astrea             | June      | 18 |
| †Patriot           | April    | 7  | Kate               | June      | 26 |
| †Rapid             | April    | 7  | Hortensia          | July      | 8  |
| †Elliotts          | April    | 18 | Lucy               | July      | 3  |
| †Delight           | April    | 29 | Fred. Young        | August    | 29 |
| †Martha            | April    | 25 | Mars               | July      | 17 |
| Apollo             | April    | 30 | Moslem             | July      | 25 |
| Lady Keith         | April    | 30 | Livorno            | July      | 27 |
| Celt               | May      | 15 | Cuba               | August    | 31 |
| †Portia            | May      | 12 | Hopewell           | September | 7  |
|                    |          |    | Jane               | October   | 31 |

At the period when these ships sailed, the plague was raging most violently in all quarters of the town. The ships' names which are marked thus (†), had the plague on board among their crews.

Let us now see what are the conclusions to be drawn from the above data. Here we have twenty-five British ships clearing out from Alexandria, during a year of epidemic plague, and carrying into Great Britain no less than 31,000 bales of goods, supposed to be capable of contamination in the highest degree; of these twenty-five ships, eight actually had the disease among their crews during the time they were loading. All these vessels when they arrived in England had to perform a long quarantine, for the supposed purpose of purifying the cotton from the latent fumes it was supposed to contain. If the quarantine officers did their duty, all these bales

of cotton should have been ripped open and freely handled, first by the crew, and afterwards by porters and other persons appointed for such duties,\* in the presence of a quarantine guardian, and if no person were attacked during this expurgation, and after a period of forty days, or more, according to circumstances, the ship's company were entitled to pratique.

My own personal experience extends only so far as the loading of the ships is concerned, and to the fact that the highly susceptible goods which composed their cargoes, having been exposed in every way to contamination.† If the assumption that this material can convey the disease, nay, will infallibly do so if not guarded against by quarantine, into other countries, be true, we should surely have seen it appear in the lazaretto, among the crews of the ships and the persons employed to handle and air the cotton. It can hardly be said, with anything like reason, that this experiment, on a scale to the extent of upwards of six millions three hundred thousand pounds weight of a very susceptible article, was an exception to a general rule. It may, not unfairly, be assumed, that, if the disease was not carried into our lazarettos in England, by these vessels arriving at so many different seasons of the year, it is impossible it can be so conveyed. Now let us ask

\* See Order in Council, Cap. XXXII. All bales of cotton shall be open from one end to the other, and so much taken out as to leave room for handling daily the interior of the bale.

† In the year 1800, the ships "Aurora," "Mentor," and "Lark," from Mogadore, were destroyed with their cargoes, pursuant to an order in council of the 7th of January 1800 (grounded upon a representation of the committee, consisting of His Majesty's physician and others), great suspicion being entertained of the same being infected with the plague. The master of the "Lark" died at Mogadore, where the disease was raging at the time the vessels sailed; and it was reported that nearly all the persons who assisted in loading the ships also died of the plague.

In August 1814, a large quantity of hare skins, imported in the "Lucy," from Smyrna, were burnt, upon a report made to the Lords of the Privy Council, from the Consul at Smyrna, that the persons who were employed in removing and packing the skins, had died of the plague. (See Report on an Order of the Select Committee of the House of Commons respecting the contagion of the plague. Appendix, No. 3. 1819.)

At Alexandria, in the year 1835, the master of the "Delight," and his second mate, both had the plague while loading cotton; the mate died, and the master recovered, and took the ship to Liverpool. The master of the "Elliotts," and one of his men, had the plague also while loading cotton; they both recovered, the master, however, being left behind. The mate of the "Martha" was attacked while loading cotton, but recovered and went home in the ship.

I professionally attended these individuals, and reported the cases as they occurred to the consul, and consequently there could be no mistake. I am somewhat surprised that it was not thought necessary to destroy their valuable cargoes, and that they were admitted to pratique after the usual quarantine. If their destruction was not necessary for the public security, and when the disease was known to have been on board, then it follows that the "Aurora," "Mentor," and "Lark," might have been with equal safety in 1800, allowed to have performed an expurgation.

one question:—have any individuals, either among the crews of the vessels, or among the persons employed in the expurgation of the cargoes, been attacked with the disease after the arrival of the vessels in British ports, or has any death or sickness ever occurred under even suspicious circumstances? If this question be answered in the negative, are we not justified in concluding that the appearance of a pestilential disease in a country must depend upon some other cause than imported virus, and that cause being most probably of atmospheric origin, we have no control over it by sanitary regulations?

The above remarks may be considered as mere speculative conclusions from negative evidence; and it remains to be shown that the disease may be, and has been, carried from one port to another, by persons sick with it at the time of embarkation, without mischief ensuing. In the year 1836, when the plague was raging at Constantinople to a great extent, and there was not any plague at Alexandria, His Highness's steam frigate "Nile," with a crew of upwards of 150 men, was sent to Constantinople with the tribute to the sultan. She remained there upwards of a month, and communicated, without restraint, with the shore. A few days before her departure, on her return to Alexandria, a lieutenant was taken ill with the plague; he soon, however, began to recover upon steaming away from the pestilential atmosphere, and after leaving Constantinople no new attacks occurred; uninterrupted intercourse took place between the sick man and the other officers, and no precaution was adopted against contagion. Upon the arrival of the frigate at Alexandria, the officer was removed to the lazaretto, and the ship was put in quarantine for an unusually long period. Now, if the laws, which it is assumed, regulate the contagion and propagation of plague, are not erroneous, how is it to be explained that in this particular case no communication of the disease could be discovered? And is it not much more reasonable to suppose, that the disease was prevented from extending, rather from the influence of a purer atmosphere, than, as is the assumption in the Levant, that all the other individuals on board the ship were at that particular moment unsusceptible of the contagion?

Having thus taken a slight but practical view of the question, I can come to no other conclusion than that the propagation of the disease, from country to country, by means of substances which have been in contact with the bodies of diseased persons, is a fable grounded upon superstition, unsupported by any evidence, and contrary to experience, and that it is a prejudice which arose when it was more gratifying to the ig-

norance and credulity of mankind, to impute the origin of a pestilential disease to importation from abroad, than to a domestic source among themselves.

4. The next division of our subject is to inquire "How long the infection of plague may remain dormant in an infected person, before it declares itself by evident symptoms." Upon this point I have no evidence, founded upon experience, to give, and it would be presumptuous to venture an opinion. Diseases which have their origin in specific morbid poisons, such as *lues venerea*, and itch, generally manifest themselves in a very few days after the infection has been received, and one disease alone stands as an exception to the rule (hydrophobia). If there were any analogy between these diseases and the one which is the subject of the present inquiry, a theory might be raised which might be subjected to the test of experiment; but feeling satisfied as I do, that the disease is the result of atmospheric influence, and consequently it is impossible to decide when a person becomes infected, I am quite incapable of coming to any conclusion as to how long he may remain so without the disease being manifested by evident symptoms.\*

5. "As to the virus or morbid matter of plague, lodged in inanimate substances, and the manner of purifying such substances," I am not prepared to offer any suggestions upon the subject, from not being as yet convinced that this question is not entirely grounded upon a fallacy, and that it assumes a condition of certain substances which has not been proved even to have existed. A few brief remarks, however, upon the arrangement into the division of susceptible and non-susceptible articles, which has been made hitherto, may not be out of place in this point of our inquiry.

The property which various substances, it is assumed, possess of retaining for a very considerable length of time the virus of plague and other diseases, so as to be capable of communicating these diseases to persons placed in contact with them, has led to their being somewhat arbitrarily arranged in two classes, namely, animal and vegetable substances. Mineral substances are supposed to be perfectly incapable of conveying the morbid fumes, and are consequently ranked as non-susceptible. Fluids such as oil, water, wine, spirits, &c., &c., are also not capable of conveying the disease. Wood is non-susceptible.†

\* Dr Mead makes a very important remark upon this subject. "If there has been no sickness in the ship, I see no reason why the men should perform quarantine. Instead of this they may be washed, and their clothes aired in the lazaretto, as goods, for one week." (See MEAD, *On Plague*, page 86.)

† See Order in Council, Cap. XXXI., XXXII., XXXIII., and XXXIV.

Ivory is not in the list of enumerated articles, and consequently, I presume, is considered non-susceptible. The last-mentioned substance presents the only incongruity in that division of enumerated articles which belong to the animal kingdom with which I am acquainted ; but I am quite at a loss to conceive upon what scientific ground it can have been consistently omitted, when we find horn, and leather, and parchment, and hair, enumerated, and particularly mentioned as substances to be especially guarded against.

When we come to the articles belonging to the vegetable kingdom, we have more inconsistencies, which cannot fail to strike even the most superficial observer with some degree of astonishment. We find among the numerous articles enumerated as highly dangerous, "canvass, cordage not tarred, flax, hemp, linen, mats and matting, nets, pack-thread, straw, tow, cork, &c." Now all these articles are composed of woody fibre,\* in different forms, that is to say, of precisely the same substance as wood and nothing more ; and yet it is not considered necessary to lay any injunction upon the latter, while the former are subjected to an ordeal of fumigation and purification, in order to drive out the contaminating principle with which it is supposed they may be charged. To say the least this is a very arbitrary arrangement ; and I think if it were subjected to the test of positive experiment, it would be found to be as fallacious as it is unscientific.

Having now brought to a conclusion this slight sketch of my experience and observations in the investigation of this disease, it only remains for me to make a few remarks upon the manner in which they have been conducted. When I first came to Egypt, I had not the intention of devoting any particular attention to this subject, and from having been long accustomed to regard the dogmas of the schools with considerable reverence, I considered the question as long ago settled, and as one which did not require further investigation. Circumstances, however, did not allow me to continue long in the dark, and soon forced me to commence an inquiry. I was startled by the apparently monstrous absurdity of some of the propositions which were constantly offered to my notice ;—my contempt was excited for the chief supporters of these absurdities, from their general ignorance and credulity on all subjects of science. Impossibilities were related to me as facts, and stories which would have done credit to the inventive ge-

\* The difference between cotton and flax, hemp, &c., consists in the former being composed of a downy substance, called vegetable fibre, and the latter of woody tissue.

nus of Boccaccio, or Defoe, were regarded with the awe and reverence pertaining to the mysteries of religion. When I came to analyse the subject, and to endeavour to winnow out the truth, I was much struck with the boldness of assertions, and the over-strained assumptions, which were every day allowed to usurp the place of unbiassed judgment and calm and scientific reasoning. I found numbers of persons who had had the disease in their houses, and had in consequence lost members of their families; to my inquiries they all replied, that the appearance of the disease was to be attributed to a breach of quarantine, seeming by some strange infatuation to forget that, if a slight breach of quarantine could bring the disease within their doors, the actual existence of the disease must contaminate all around. I had fortunately an opportunity of practically investigating the disease, by the breaking out of as violent an epidemic plague, in the year 1835, as is to be found on record in the annals of Egypt; and I have since had ample opportunity of observing the laws which it follows, by the frequent recurrence of the disease in a sporadic form.

The opinions which I have expressed in the above report are the result of the experience which I have thus acquired, and I trust that in thus firmly expressing the conviction I have come to after long and patient inquiry, I shall escape the imputation of having been in any way biassed in my judgment by a love of innovation or change. If the subject has ever been entered into practically, without a bias on either side of the question, and where facts and the evidence of the senses have been the tests upon which the judgment has been exercised, I have done so upon this occasion. I commenced the subject as a matter of science highly interesting to the profession of which I am member. I supported myself during the years which it has occupied by the exercise of that profession, and being in no way employed or connected with the Egyptian Government, I am free from any influence it might exert to bias my judgment. In conclusion, I have only to remark, that if future experience and investigation should prove that I am wrong, and that the views I take of the question are erroneous, I trust I shall at least be allowed the merit of having conscientiously endeavoured to do my duty, and of having, in some small degree, contributed to throw a light upon this complicated subject.

#### APPENDIX.

##### *1. Notes and Illustrations by the Author on the preceding Report.*

1. As an illustration of the vexatious nature and severity of the

present quarantine establishments, I may be excused the relation of the following fact. A friend of mine left Alexandria a few years ago, for the purpose of meeting his lady at Malta, who was coming from England. The packet which brought the lady from England was of course in pratique, and the ship from Alexandria in quarantine. When the lady left the packet to join her husband in the Lazarette, she was handed down by one of the officers, but unluckily, before she quitted the hand of the officer she had taken that of her husband with the other hand, and although she quitted in a moment, the circumstance did not escape the vigilance of the quarantine officer, and the packet which she had quitted was placed instantly in a strict quarantine as if it had come from an infected port.

What a chain of assumptions we have in this case. The gentleman quitted Alexandria when there was no plague known to the authorities to be in the country, he arrived in Malta and continued in the most perfect health; here it is first assumed that there might be plague in Egypt notwithstanding it was unknown to the authorities: the second assumption is, that he, notwithstanding his robust appearance and excellent spirits, might have the plague, or be infected; and the third is, that by having hold of one hand of the lady and the officer of the clean ship of the other hand, the virus could or would pass, in a moment, from him through the lady (like electricity,) attack the purser, and through him the whole ship's company, till no one could tell where it would end. I need scarcely add, that none of these dire anticipations were realized, but that all parties remained in uninterrupted good health.

Sir Joseph Laffan, who has lately been devoting himself to inquiries into this particular question, and who has been travelling extensively in the East with the object of obtaining information on the subject, told me, that an inspector of quarantine at one of the continental ports had assured him, with considerable earnestness, that if a person affected with the plague was stationed at a distance of a mile from them, and if they were in contact with, or had hold of a cord which would extend the whole distance, and the other extremity of which was in contact with the diseased person, they would infallibly be infected with the disease through the medium of the cord. This may appear to be so absurd as to be hardly worth recording, but it is important when we reflect that this person, holding an important office, was in no way trifling, but was confidently expressing his belief in a superstition, which has triumphed over the minds and common sense of thousands.

2. It has been a favourite assumption, from the earliest ages, with all writers upon the subject of plague, that the disease did not originate in their own particular country, but had been brought to them from abroad. This in modern times has been raised into an argument in favour of imported infection, and the supporters of the present system of sanitary regulations triumphantly refer to history and the experience of ages for a confirmation of their theory.



A slight examination and analysis of this miscalled evidence, may throw some light upon the subject.

The earliest writer who records the history of an epidemic plague is Thucydides, and no better account than his has ever been published, although many have made attempts at imitation; his account is simple and affecting, bears no evidence of exaggeration, and is undoubtedly the plain unvarnished truth. It appears from his account, that the Athenians were as much imbued with the feeling that the disease could not have originated among themselves, but must have come from abroad, as are the moderns at the present time. He gives a slight sketch of its supposed origin and whence it came, but let it be remarked, he gives it entirely as conjecture. "It broke out first, as it is said, (says Thucydides,) in that part of Ethiopia which borders on Egypt; it afterwards spread in Egypt and Lybia, &c. &c." In the next sentence, he says the disease first showed itself in the Piræus, which occasioned a report, that the Peloponnesians had caused poison to be thrown into the wells: and then he adds,—as if he did not believe any one of these and other vague reports, "Let every one, physician or not, freely declare his own sentiments about it; let him assign any credible account of its rise, or the causes strong enough, in his opinion, to introduce so terrible a scene. I shall only relate what it actually was," &c. &c. The writer in no place attempts to support the opinion of its being imported, but seems rather to have offered the opinion of the day as a conjecture on a subject which he found quite inexplicable. He seems to have considered that it could be communicated from one person to another, however, as he tells us that an army which was sent from Athens to assist in the siege of Potidæa carried the infection along with them, and communicated the disease to the army they were sent to assist, and which had hitherto been in a healthy state.\*

What the opinions of this admirable and doubtlessly correct historian were upon the question, is of little importance. Fortunately, he has recorded so many facts, that we can examine the subject almost as well as if we had been present. Let us see, then, what was the state of Athens and its territories when the plague broke out; what were the facilities afforded it to spread itself over the whole of Greece; and to what degree the malady extended itself when quarantines had never been heard of, and could not have been enforced.

The plague of Athens broke out in the beginning of summer, in the second campaign of the Peloponnesian war. By the advice of Pericles, the republic of Athens had decided upon withdrawing the whole population of Attica from the country within the walls of the town, upon the first advance of the Peloponnesian army, and acting in their own territories entirely on the defensive. "They withdrew from the country their children, their wives, all the furniture of their houses there, pulling down with their own hands the timber

\* See Thucydides, B. II, p. 162, Smith's translation.

of which they were built. Their flocks and their labouring cattle they sent over into Eubœa and the adjacent islands. But this removal was a very grievous business to them, since it had been the ancient custom of many of the Athenians to reside at large in the country.\* “When they were come into the city, some few had houses ready for their reception, or sheltered themselves with their friends and relations. The greater part were forced to settle in the less frequented quarters of the city, in all the buildings sacred to the gods and heroes, except those in the citadel, the Eleusinium, and any other from which they were excluded by religious awe. There was indeed a spot of ground below the citadel, called the Pelasgia, which, to turn into a dwelling place, had not only been thought profaneness, but was expressly forbid by the close of a line in the Pythian oracle, &c. Yet this sudden urgent necessity constrained them to convert it to such a use. Many of them, further, were forced to lodge themselves within the turrets of the walls, or wherever they could find a vacant corner. The city was not able to receive so large a conflux of people. But afterwards the long walls and a great part of the Piræus were portioned out to them for little dwellings.”†

The garrison of Athens, according to the statement of Pericles, at the period when they retired into the city, consisted of 13,000 heavy armed troops, 1600 city guards, 1200 horse, and 1600 archers, making a total of 31,800 fighting men, besides the crews of 300 triremes fit for sea.

Thus was the whole population of Attica, unable to make head against the formidable numbers of their opponents, obliged to shut themselves up in the city while the enemy advanced within a few miles of their gates, laying waste the whole of the surrounding country, and only retiring into their own territory on the approach of winter, in consequence of having consumed all the provisions which the district afforded. A large agricultural body was shut in, idle and unemployed, and the results were then the same as they would be in modern times; crime and vice, sedition and tumult, misery and famine, were the forerunners of pestilence, and then the cup of wretchedness was full. The plague broke out in Athens very soon after the second irruption of the Peloponnesian army, that is to say, at the beginning of the second campaign, when all the population had again retired within the walls, and the horrors which attended it are, I believe, in no way exaggerated by our faithful historian. “Before this reigning calamity,” says Thucydides, “the general removal from the country into the city, was a heavy grievance, more particularly to those who had been necessitated to come thither. For as they had no houses, but dwelled all the summer season in booths, where there was scarce room to breathe, the pestilence destroyed with the utmost disorder, so that they lay together in heaps, the dying upon the dead, and the dead upon the dying. Some were tumbling one over another in the public streets, or lay expiring round about every fountain. The temples in which

\* See *idem*, p. 137.

† See *idem*, p. 140.

they had erected tents for their reception were full of the dead bodies of those who had expired there, &c. &c.;" and a little farther on he remarks, "The city was one scene of death, and the adjacent country of ruin and devastation."

Such is the simple but solemn account of what came under the personal observation of this author; he evidently connects the breaking out of the disease with the crowding together of large bodies of people within the walls of the city, the desolation without the walls, and the tumult and crime within. To these he adds, in his introduction, the occurrence of some natural phenomena which he evidently connects with the appearance of the disease. "Earthquakes, for instance, which affected the largest part of the habitable world, and shook it with the utmost violence; eclipses of the sun, which happened more frequently than former times had remembered; great droughts in some places, the consequence of which was famine, and what made not the least ravage, but did its share of destruction, the noisome pestilence."

We learn from Thucydides, that during the existence of this dreadful calamity, the Athenians fitted out several expeditions by sea to harass and annoy the enemy, and succour their allies: that one of these expeditions sailed for the Peloponnesus after the breaking out of the plague, with no less than four thousand heavy armed men, and three hundred horsemen on board; that they were joined in their expedition by the Chians and Lesbians with fifty sail of vessels; that they attacked Epidaurus, a city of Peloponnesus, ravaged a great part of the country about it, and tried to take it by storm; that they ravaged the country about Traxena, Halias, and Hermione, and in fact all the sea-coast of the Peloponnesus to the eastward, and then returned back to Athens. This author distinctly states that "the whole space of time that the Peloponnesians were upon the lands of the Athenians, and the Athenians employed in their sea expedition, the plague was making havoc both in the troops of the Athenians and within the city," and states that there was a report, that "the Peloponnesians, for fear of the infection, as having been informed by DESERTERS that it raged in the city, &c. &c." retired out of their territory with some precipitation. Yet, he says, "they persevered in this incursion longer than they had ever done before, and had made the country one continued devastation."

One of the most important facts recorded by this writer is a concluding observation: "The pestilence broke out immediately upon the irruption (into Attica) of the Peloponnesians, and never extended itself to Peloponnesus—a circumstance which ought to be related."

Now here is a mass of historical evidence diametrically opposed to the theory of importing and exporting the disease. The Athenians were in direct communication, by sea, with a great number of other states, and an intercourse was kept up during the whole of the time; they were joined by their allies; they ravaged the coasts, and attacked the towns of their enemies; the islanders of

Chios, and Lesbos, of Eubœa, and of nearly all the Cyclades, the Carians, Ionians, and all the nations on the coasts of Asia, and of Thrace, were in alliance and communication with them, yet the disease never spread out of Attica, except among the troops at the siege of Potidæa. The disease appeared neither in the Peloponnesian army, which received deserters from the Athenians, nor in the Peloponnesus, where the infected army was desolating. The troops which went from Athens to Potidæa, were four thousand in number, and one-fourth of them died of the plague, and they communicated the disease to the army before that town: a very natural consequence of crowding such a large body of men from a town where an epidemic was raging, on board of ship, for a voyage of several days' duration. The disease carried off one thousand and fifty out of the four thousand men, under the command of Agnon, of which the force sent from Athens consisted, in the space of forty days, and the remainder returned home to Athens, leaving the original force to carry on the siege. It does not appear that the disease spread to any extent among the latter, for they were not only able to carry on the siege, after the infected army left them, but actually compelled the town to surrender before the end of the year.

That the Athenians, generally, had no idea that the disease was directly imported from abroad is perfectly clear from the speech of Pericles, who, in defending himself says, "What, though beyond our expectations we have suffered the sad visitation of pestilence? Such visitations no human foresight will be able to prevent—though I know that even this bath, in some measure, served to sharpen your aversion to me, &c. &c."\* "The evils inflicted by heaven must be borne with patient resignation, and the evils by enemies with manly fortitude." If it is maintained that Thucydides means to say, that by general report it was supposed to have been brought from Egypt to Athens, and that he believed that report, it is just as reasonable to maintain that the Athenians believed that the disease originated from their wells being poisoned by the Peloponnesians, and that Thucydides was of the same opinion, for he mentions both in consecutive sentences, and, let it be observed, mentions them only as popular reports. He speaks of the disease as having been known in, not imported from, other countries; he does not say that even report said it was carried, but he says it spread; that is to say, that a disease, known to have existed in one country, extended itself to another, and on every occasion, when speaking of the progress of the malady, he alludes to its active, not its passive quality. He says that the army sent to the siege of Potidæa was *followed* by the plague even there, (no word is said about carrying,) and that they gave the disease to the army encamped before the town, and which had hitherto been free from the complaint. This is perfectly simple and intelligible; four thou-

\* The cause of it (the plague) was generally imputed to Pericles, who, by drawing such numbers into the city, was thought to have corrupted the very air. —Goldsmith's History of Greece.

sand men were embarked in galleys, to be transported to a distance of upwards of two hundred and fifty miles by sea; they were taken from a town where a pestilential disease was raging, and that disease broke out among them, and destroyed, in forty days, a fourth of their number, and communicated the malady to a few of the other army—they then returned home, and no more is heard of the plague among the latter.

The above is a brief analysis of the leading points of the history of the plague of Athens, as handed down to us by Thucydides. This is the history which has always been triumphantly referred to as being the earliest testimony in support of imported contagion; with as much justice might the frightful mortality in the black hole of Calcutta, during a period of only one night, be imputed to the same cause. The vanity of every nation will even deny that this disease could have originated, or does exist endemically, in their own particular country: the Greeks disowned it; the Persians reported it as coming from Egypt; and the Egyptians referred the discredit of having generated it to the Ethiopians, and the latter, for anything we know, attributed its origin to some other district. The same is the case at the present time; Egypt is in quarantine with Constantinople and Smyrna, and they are in quarantine with Egypt. During the epidemic plague of 1835, when the disease was at its height at Alexandria, and nearly two hundred a day were buried, the quarantine officers of the port actually placed a vessel, with some English gentlemen on board, from Constantinople, in strict quarantine, for fear they should bring the disease! According to the account of all it is not indigenous to them—quarantines have been established to keep it out, and have signally failed. At Malta, at Marseilles, at Odessa, in Egypt, in Syria, &c. &c., their regulations have been enforced to a merciless and atrocious extent; and notwithstanding all their precautions—notwithstanding the smoking, and purifying, and imprisoning—the disease has, at different times, appeared and spread desolation around. Experience, however, has produced no wisdom, the darling vanity has always triumphed,—a breach of quarantine has always been assumed, and the precautions have been doubled.

The trouble which almost every modern historian of this disease has taken to prove that the plague did not originate endemically from local causes in his own country, is enough, of itself, to give rise to a suspicion that there was always a large party whom it was worth while to convince of the truth of his position, and who were of an opposite opinion. The fact is, the public have been promised security through the medium of quarantine regulations—and these means have repeatedly and signally failed; it is therefore necessary to satisfy the public, that it has been by the evasion of these regulations that their security was endangered, and the disease brought to their families and homes. The endeavour to accomplish this has given rise to various productions, filled with the most extraordinary fables and fallacies, and of which the following analysis of the history of the plague at Malta, written by the "Inspector of

Quarantine, and President of the Board of Health of the Ionian Islands," may serve as an illustration.

The plague of Malta, in 1813, first appeared in the Lazarette of that island, in a ship from Alexandria, called the "St Nicholas," the master and some of the crew perishing from the disease. The vessel was not admitted to pratique, but was in strict quarantine all the time she was at Malta, and until she was sent back to Egypt under the convoy of a brig of war. It is remarkable that none of the crew, put on board to navigate her back to Alexandria, were taken ill. The authorities at Malta were fully aware, from the moment of the ship's arrival in port, of the existence of the disease on board,\* and the most severe measures, in addition to the ordinary precautions, were instantly adopted† to ensure the public safety. Now, let it be observed, that the St Nicholas arrived on the 28th of March, and the captain, and one of his men, died in the Lazarette, on the 7th of April, of plague, and on the 10th of the same month the infected ship was sent back to Alexandria, so that she remained at Malta only thirteen days. During this period the most anxious attention was paid by the authorities to protect the public from contamination; guardians of health were sent on board the vessel, and every possible precaution adopted; so much care, indeed, appears to have been taken, that all alarm had passed away after a few days.‡ Yet, notwithstanding all these precautions, the plague was discovered in the house of a poor shoemaker, on the 16th of April, and from communication with him and his family, it is said to have spread over the whole island. The daughter and wife of the shoemaker were the first attacked, and died in a few days, and the shoemaker himself was sent to the Lazarette with symptoms of plague. On the 5th of May, the medical officers, "*after the most accurate examination*," stated, that there did not exist a case of suspicion in the whole island, with the exception of the shoemaker," safely lodged in the lazarette; yet we are told, by the same authority, that only two days afterwards, the 7th of May, many cases of suspicion were reported.§ On the 16th of May, "the disease began visibly to increase,"—many deaths were announced, and it now appeared that contagion had everywhere insinuated itself, &c. &c., and hence it assumed the epidemic character. The same authority tells us, in the same page, that on the 17th of May, (*only one day later*,) the advance of the disease became greatly alarming, dilating itself through the medium of communication to the remotest parts of the city. Government deemed it expedient to direct, *under the penalty of death*, "all heads of families to make an immediate report to the Board of Health, or to persons deputed by that body, of the slightest appearance of sickness in their respective families, and concealment, on the part of any individual of an age liable to the penalty of the law, was made a capital crime." The author then goes on to assume that, notwithstanding all these

\* See Tully, History of Plague at Malta, page 37.

† See *idem*, page 36.

‡ *Idem*, page 39.

§ *Idem*, page 43.

precautions and arbitrary measures, the inhabitants of Malta, who, he has before told us, laboured under the most dreadful horror and excitement at the disease being merely in the lazarette, so far from attending to the warning and threats of the authorities, or yielding to the influence of their own fears, persisted in such communication and intercourse, that the disease was carried over the whole island.

The above is a slight sketch of the breaking out of the plague in the island of Malta; let us now see how it was said to have been conveyed from the St Nicholas to the town; that it was so conveyed is assumed upon several grounds, but not a particle of evidence.

\* 1st. It is said the disease first appeared in the house of the "shoemaker, Salvatore Borg, in Valetta, a man who it was known placed little dependence upon his trade, chiefly relying upon his speculations, as a smuggler, for his subsistence.

"2d. Immediately after this event it attacked the child of the master of a wine-house, in a place contiguous to the quarantine harbour, the resort of persons of the character of Borg, and where the very under servants of the Health Office, who had charge of the St Nicholas, were accustomed to retire.

"3d. Some of the health guards of the St Nicholas were among the first attacked.

"4th. The health guards, thus attacked, had been in the habit of dealing with Borg, and selling to him articles which they occasionally received from on board ships, sometimes as presents, and sometimes as speculative purchases.

"5th. The persons who were next and in succession attacked, were those who had made purchases of susceptible goods from the shoemaker, Borg, and who themselves traced their disease from this very source.

"Lastly, the situation of Sliema, the residence of the proprietor of the wine-house above mentioned, was too conveniently situated to favour smuggling: as at the period alluded to, that or any other similar transaction might have been effected there, even without the knowledge of the under servants of the quarantine departments. From all which, says our author, it is certainly but just to conclude, that the generally received opinion is but too true of Borg's having received infected goods clandestinely from the St Nicholas."

The above summary includes all the arguments which the warmest, if not the ablest, supporter of imported contagion has to offer in this particular case. Let it be observed, that in all the six points from which the conclusion is drawn, there is not a single fact recorded, they are all far-fetched assumptions. In the first it was said Borg was a smuggler as well as a shoemaker. Where is the evidence for this? That he had ever been charged with or punished for the offence, is not asserted; it is merely said he was a shoemaker and a smuggler. In the second, "The child of the master of a wine-house, the resort of persons of the character of Borg, was attacked." A pretty argument truly; it is not even pretended to

\* I quote verbatim from Tully.

prove that Borg, or any of his family, ever were there at all ; but only that people of his character went there ; and it is therefore most absurdly assumed that he must have gone there. Why could not the master of the wine-house have been smuggling as well as the poor shoemaker ? With regard to the third and fourth points, I do not see how they bear upon the subject, as relating to the importation of the disease by Borg. The fifth point is important if it could be substantiated : " The persons who were next, and in succession attacked, themselves traced their disease to the purchase of susceptible goods from Borg." When a broad assertion like this is made, one would think it would be worth the while of the author, who could devote the labour of compiling a work of nearly 300 pages expressly for the purpose of supporting his own views of the question, to give us a few data, let us know who these people were, what were the articles they purchased, and when and how soon afterwards they were attacked, &c. &c. ; and yet we have nothing but the mere assertion, which we may believe or not, just as we please. The concluding argument is so absurd as to be hardly worth notice. The peculiarly advantageous situation of the wine-house for smuggling, &c. &c., just as if it could be maintained for a moment that a house being conveniently situated for smuggling, could lead to an assumption of the owner or occupier must necessarily be a smuggler.

Now let us take a common sense view of the case. The St Nicholas arrives in the harbour of Malta on the 28th of Malta, with the plague on board, and the authorities are instantly made acquainted with the circumstance. Our author tells us the circumstance " excited considerable alarm amongst *all classes* of the inhabitants," and that the most energetic measures were adopted to enforce a strict observance of quarantine—guards were put on board to prevent the possibility of any evasion—the captain and crew were taken from the ship and put into the lazarette the next morning after the ship arrived, and on the 10th April the Government put a fresh crew on board and sent her back to Alexandria under the escort of a vessel of war. This ship was regarded with the most universal horror by every class of persons. The attempt to communicate with her subjected the offender, if detected, to the punishment of death ; and if observed in the fact by the guards, he would have been shot down at once.\* The crew, it would appear, almost to a certainty could have had no smuggling transactions, as they came into port with their vessel in the morning, and every attempt at communication could hardly avoid observation by the vigilant eyes of the health officers. And they were allowed to remain on board only twenty-four hours, after which time, if any smuggling had been carried on, it must have been done by the persons put on board by the health office. It is perfectly incredible to suppose any person would expose himself to all these risks. It is perfect folly to believe he could have succeeded after all these precautions ; or if he could and did, as is assumed, it is perfectly useless to persevere in

\* This has been done, I am informed, more than once at Malta.



cur endeavours to keep out the disease by quarantine regulations, inasmuch as we see by the present instance, that every caution and care of a most vigilant government, supported by popular opinion, has been evaded.

It may appear, at first sight, a somewhat remarkable circumstance, that the disease should be discovered in the city of Valetta in so short a period as nineteen days after the arrival of the infected ship; but if we examine the circumstance with a little attention, it will be easily accounted for. In countries where the disease is of frequent occurrence, as Egypt, for example, we have cases of plague occurring now and then (sporadically) which excite no sort of attention if not made of importance, as they have been of late, by the vigilance of quarantine officers. An epidemic plague never breaks out suddenly at one moment, but it commences gradually, and increases as the season advances. The first cases are in general of so mild a character that few of the patients die; many even never complain or desist from their employments, yet these persons have buboes, and slight fever, and headach, &c. &c. As the season advances, or as the air becomes more pestilential, the disease assumes a graver form, and some die, and the average mortality of any place is observed to increase. This excites attention, and the cause is discovered upon the first inquiry. Now the plague might have been in Malta for weeks before the arrival of the St Nicholas without exciting any particular attention, and no physician would have ever suspected that a patient applying to him for advice for a small tumour in the groin or axilla, and having only a trifling degree of fever, was infected with the plague—(such, in fact, were the first cases I saw in Egypt); but when the attention of every person in the island was attracted to the subject by the arrival of a ship having the disease on board, every case would be scrutinized with the utmost vigilance. At length the daughter of Borg the shoemaker was taken ill and died, and in conformity with what I have said above, the case was not suspected by the medical attendant, and she was buried in the usual way. A few hours afterwards the girl's mother was attacked, and complaining of pain in the groins, excited immediate suspicion, and after a consultation of physicians, and *after minute* examination, the disease was declared to be highly suspicious. This woman died a few days afterwards; and then the shoemaker was taken ill, and sent to the lazarette. Now let it be observed that on the 5th May, (the first case having occurred on the 19th April), the report of the physicians, after the most accurate examination, stated that there did not exist a case of suspicion in the whole island; with the exception of the shoemaker, who had been transferred to the lazarette. On the 21st May, five cases were discovered; a period of seven weeks from the supposed arrival of the infection intervening. The progress of the disease was still slow, and it did not advance till the summer season. It then spread violently and epidemically, and then gradually died away, or was said rather to have been driven away by the energy of the government, and on the 29th January 1814, the island was declared by

proclamation to be free from the disease. To return, however, to the point ; it does not appear that it is in any way certain that there was no plague before the arrival of the *St Nicholas* ; all the evidence goes to show that the disease gradually appeared after the ship had left, and that the attention of the whole population being then directed to the subject, a case or two of suspicion were then found out ; but several months elapsed before any thing like an epidemic was established.

One most remarkable circumstance in the history of this plague, as recorded by Mr Tully, is the total silence he preserves as to the fate of the man Borg, who was said to have smuggled the disease into the island. He tells us that Borg's wife and daughter, and also his father and son, died in the lazarette ; but as to the man himself, all we are told is, that he was sent to the lazarette with symptoms of the disease upon him. If he recovered, I think we ought to have been told of some proceedings for the purpose of proving his guilt ; and if he died, we should also have been entitled to the satisfaction of knowing that his *crime* ? met a just retribution.

3. I have had repeated opportunities of seeing whether the personal attendants upon plague patients contracted the disease from them submitted to the test of experiment. One or two instances will serve as illustrations. The master of the brig "*Delight*," in the port of Alexandria, was taken ill with the disease on the 8th March 1835, during the height of the epidemic. I attended him on board his ship, and visited him twice a day till he recovered. The cabin-boy nursed and attended upon him, and his mate rendered him every assistance in his power, being constantly in contact with him ; the cabin-boy slept in the same cabin (a small confined place) during his whole illness ; these individuals remained in perfect health. The master of the brig "*Elliotts*" was also attacked with the disease in the most malignant form ; he was nursed by the cabin-boy, and looked after by several other persons, who were necessarily in contact with him during the whole time he was ill ; the result was the same as in the former case. An Arab gardener, who assisted frequently in removing the dead, and who, on one occasion, had a desperate struggle with a patient, who, in a violent fit of delirium, rushed out of the house, and would have thrown himself into a well but for his humane interference, contracted no infection during the whole epidemic. Upon one occasion I was called to visit an old and much respected Arab gentleman, whose daughter was sick from the plague. I found the father holding his child, who appeared to be about three years old, in his arms ; the patient was covered with petechiæ, and in the last stage of the disease ; the mouth, and gums, and tongue were coated with sordes, the typhoid stage of the disorder having come on. When I told the parent that the case was hopeless, he drew the child to his breast, and I left him awaiting its decease, with the resignation and fearlessness of a pious Mussulman. On another occasion, a young girl, whose mother died somewhat unexpectedly of the disease, threw herself upon

the bed and embraced the corpse, and so remained for some time till taken away by the bystanders. In addition to this exposure to infection she had been, during the whole illness of her mother, in constant and most assiduous attendance upon her, and slept in the same room with her, and assisted her in every way, so as to be as much in contact as could be desired if we were trying an experiment. This girl, as well as many other persons who had been exposed in a less degree, all escaped unharmed.

It is useless to multiply instances, the results of all which were the same. The experiment has been tried on a large scale in Egypt, where the Pacha has, for many years past, been endeavouring, by the advice of some of the European consuls, to extinguish the disease in his dominions, by the means of quarantine regulations.\* A lazarette has been established, a Board of Health, consisting of several consuls, has been instituted, and the most merciless system of quarantine adopted, that has ever disgraced the world. No corpse is allowed to be buried till it has been inspected by a sort of medical officer of quarantine, who decides the question, or rather pretends to do so, by an inspection only, for he is not allowed to touch it. If his caprice or opinion turns to the side of plague, all the persons who have been, in any way, in contact with the deceased, with all their clothes and baggage, are hurried off to the lazarette to perform the proper expurgation. Every case of plague which is discovered, in towns or villages, is immediately shut up in the lazarette, and a general system of purifying carried on. I had an opportunity, the other day, of speaking with the medical officer in charge of the lazarette, upon this question, and I asked him if his experience bore witness to the circumstance of people who were carried there, in consequence of having been in communication with plague, or in proper quarantine language, compromised individuals, being frequently attacked while performing their expurgation there, and his reply was these words, "*Sometimes we have attacks, but in general not*"—so that the general rule is established by experiment, repeated in hundreds of instances, that in cases of plague the parties compromised are in scarcely any danger at all, and are very rarely attacked.

These observations apply chiefly to sporadic cases of plague, as the disease occurs at present in Alexandria, or to the cases which are discovered early in a plague season, and the sick are not accumulated at the lazarette in great numbers—when the latter happens the disease spreads with dreadful violence, and a pestilential atmosphere is formed which is destructive to all alive.

\* A similar attempt was made at Milan more than two centuries ago. The sick and all the persons living with them were removed to the lazarette, or if suffered to remain were placed under the charge of an officer appointed to ensure their perfect seclusion; but the mortality increased in spite of everything, and then the pious Milanese determined upon carrying the relics of one of their celebrated saints in solemn procession round the city; but this seems to have answered even worse, for the disease, as if in scorn, boldly made head, and ravaged with ten times more violence than before. When the disease, however, began to decline, it was discovered that the blessed Virgin had miraculously interfered in their favour; a miracle was established, and is believed to this day.

4. The assertion, that quarantine laws, and the theory of propagation by contagion, are connected with superstition, is not a mere fancy of my own, but is a fact authenticated by history. Procopius tells us that during the plague of Constantinople, in the reign of the Emperor Justinian, "The manner of its attack was this: visions of spirits, in all sorts of human shapes, were seen. The sufferers thought they met a man who struck them, and were taken ill the same moment that they saw the spectre. At first, men strove to turn aside these spirits, by *uttering the holiest names, and hallowing themselves as best they could, &c. &c.* Others, again, were taken ill in a different way, and saw some one in a dream who stood over them and struck them; or heard a warning voice that they were numbered with the dead."\* In Egypt, the Arabs of this day believe that the victims of the plague are selected by an evil spirit, or geni, which stalks abroad, and strikes with a stick the individuals who are to suffer; and the belief in this superstition is so strong that many believe they can fix the precise moment when they were struck by this invisible but mischief-working monster. It is worthy of remark, as a curious fact, that the feelings of contempt which the European and Mahomedan population in the East respectively feel for each others superstition, are about as nicely balanced as possible. The Mussulman treats the Infidel's quarantine and sanitary regulations with insolent disdain; and the European, who places all his confidence in the strict observance of quarantine, pities and despises the infatuation of the superstitious Mussulman. Still more curious will it be, if farther experience and investigation should decide, that they have each been worshipping a pure creature of their excited imaginations.

If these superstitious feelings were productive of no other results than contemptuous language and haughty disdain, we should smile at the expression of them with as much good nature as we should listen to a ghost story or a tale of witchcraft. But, it should not be forgotten, that at one period of our history a ghost story could drive the blood from the cheek of the bravest, and that many a poor unoffending old woman has been tortured and put to cruel death, amidst the exulting shouts of a populace not naturally cruel, but brutalized by superstition, on what was considered good and sufficient evidence of being a witch. The same sort of atrocity has been perpetrated repeatedly towards individuals who have been accused of clandestinely carrying about the fomes of plague, for the purpose of spreading the disease, and upon much the same sort of evidence.

During the plague of Milan, in 1630, it was supposed, "that foreign princes had generated, or at all events were maintaining, the plague with a view of weakening the power of the state, and taking undisturbed possession of it, when reduced to a solitude. A belief was propagated, that persons were employed to besmear everything likely to be touched with the most foul and pestilential compounds. The walls of houses, fastenings of doors, household implements, clothes, men's persons, &c. &c., were thought to be

\* See Procopius de Bello Persico.

poisoned by some unseen enemy. The belief originated in an unexplained appearance, the result, most likely, of some wanton joke, or malicious deception. On the morning of the 23d of April 1630, the fronts of the houses, throughout the whole length of the city, were observed, by the earliest passengers to be marked with spots, appearing as if a sponge, filled with the matter of plague sores, had been pressed against them. The whole population, ere long, was in a commotion, and poured out to see this strange phenomenon. Reports were afterwards circulated and greedily received, that emissaries of hostile princes were diligently engaged in spreading infectious poison through the city, &c. &c.

"The population were roused to such fury, and such jealous suspicion, that many fell victims, not to any imprudence, but to the commonest and most natural actions, which the prevailing frenzy interpreted into the dreadful crime of anointing. An old man past eighty, well known as a frequenter of the church of St Antony, was seen, on rising from his knees, to wipe the bench on which he meant to sit, with the skirt of his cloak. Some women raised a cry that the old man was anointing the seats. The people ran together in an instant, the old man was dragged by the hair, beaten, and kicked; the only thing that saved his life, for an instant, was the wish to carry him before the judges, and extort some knowledge of his accomplices. I saw him, says Ripamonte, dragged away thus, and never heard more of him. I think that he must have died on the instant.

"With the people in this temper, accusations and convictions for a crime, probably fictitious, were not wanting. The first victim was a person employed by the tribunal of health to make the daily round of a district, and report the names of all who were ill. He was accused by some women, who described his person, and swore that they saw him from their windows daub the walls with some preparation. *Being put to the torture*, he endured it with wonderful constancy until the fourth day; and then, when the judges were about to release him, being wearied with his firmness, he made a sort of voluntary confession, and named one Mora, a barber, as the person who had given him the ointments. The house of Mora was found full of medical or chemical vessels, and preparations, (it was then usual for barbers to practice surgery), which he declared were meant as preservatives to be distributed among his friends. The physicians, who inspected them, were of a different opinion, and declared them to be prepared for poisons; and on their report the barber *was put to the torture*, when, after several times confessing and recanting, he at length made full acknowledgment of his guilt, and of all the methods he had employed. Others, meanwhile, were apprehended upon the same charge, and made similar confessions, under the cogent arguments of the rack; and all were put to death, with circumstances of no common cruelty. Mora's house was demolished, and a column built on the spot where it stood, with an inscription to commemorate his guilt!"\*

\* These stories are quoted from Ripamonte de Peate, &c. in the Second Volume of Historical Parallels, published in the Library of Entertaining Knowledge, from which I quote, not having the original to refer to.

Fanaticism and superstition, as exemplified in the above instances, have always taken a prominent station during the existence of every epidemic plague. During the plague which desolated London, in 1665, we have historical evidence of all sorts of fanaticism and folly, which, to recapitulate, would occupy too much space. The main import of the orders issued out for preventing the disease from spreading, was, (see Mead, page 101,) "as soon as it was found that any house was infected, to keep it shut up, with a *large red cross*, and these words, *Lord have mercy on us*, painted upon the door; watchmen attending day and night to prevent any one's going in or out, *except such physicians, surgeons, apothecaries, nurses, searchers, &c. &c.*, as were allowed by authority; and this to continue at least one month after all the family was dead, or recovered." A very pleasant state of things truly, and, as Mead very justly remarks, "it is not easy to conceive a more dismal scene of misery than this. The red cross and the words upon the door were precisely the same in intention as the "uttering the holiest names, and hallowing themselves, as best they could," in the plague of Constantinople above quoted.

5. The state of medical science in the Levant is truly deplorable, and the absurdities which we see every day, if it were not for the melancholy results to which they frequently lead, would provoke our risibility. It is certainly an opprobrium to the science of medicine, that so little has been hitherto done in the investigation of this malady, and notwithstanding the rapid stride which has been made in medical science, and all its collateral branches during the last century, yet, with respect to this disease, we are still, comparatively, in the dark as to its nature and treatment. One reason for this may be, that the personal risk has always been regarded as very great, and experience seems to confirm the opinion, inasmuch as many of those who have devoted themselves to the investigation, have fallen victims to their zeal or enthusiasm; but I am inclined to think that the want of professional education and experience in the investigators, has hitherto been the cause of our ignorance on the subject. So far as my own experience goes I can say with confidence, that if the sick have proper attention paid them, and can be carefully nursed, a very large proportion do recover. But I have often had occasion to observe, that the means which are resorted to with a view to assist the sick, are such as cannot fail to hasten the fatal termination of the malady. The search after specifics is universal, and the most opposite measures are often resorted to without any apparent reason; and mere caprice, or the desire of doing something, often leads to the adoption of the most pernicious and absurd treatment. I allude to the shutting up the sick in close rooms, and preventing the free circulation of the air; the application of the actual cautery to the buboes and carbuncles; also the attempts to extirpate them with the knife, &c., instead of directing attention to the constitutional malady, and treating it as we would a case of ordinary fever, according as the symptoms developed themselves. In the Levant we hear nothing of any attempts to diminish

the delirium by soothing the cerebral and nervous systems—we see no anxiety to anticipate the stage of debility which often ensues, and during which the patient sinks; the secretions, over which we have a powerful control by medicines, are totally neglected; and all that is generally done is some absurd applications to the buboes and carbuncles, and the disease is allowed to pursue an uninterrupted career. Under such circumstances, and with such treatment, it is hardly within the bounds of possibility that any important discovery can be made, and the search for a specific is as hopeless as it is unphilosophical.

Another circumstance may be here mentioned, which has been of late years an insurmountable obstacle in the path of scientific investigation. Since the establishment of a Board of Health in Egypt, it has been the custom, as I have mentioned above, to carry away to the lazarette all persons attacked with plague, with all their families and effects, or to shut them up in their own houses, and place guards over them, to perform an expurgation of forty days. However incredibly atrocious and absurd it may appear, it is not less true, that the medical man who was attending the case was always shut up also, and not allowed to go out till he had performed a long quarantine, thus depriving all those who, in such terrible times, looked up to him for assistance, of the comfort of having their medical adviser at hand. I personally experienced great annoyance from this, as I was in constant dread of being shut up during such an opportunity for investigation; but fortunately the Pacha was subsequently induced, in direct opposition to the wishes of the Board of Health, to direct these proceedings to be abandoned.

6. The documents, of which the following are copies, are of such paramount importance, at a period when the intricate question of contagion in plague, and the utility or futility of quarantine establishments in preventing the transportation of that disease from one country to another, is again about to be examined in all its bearings, that it would be inexcusable to omit their insertion in this place. They consist of—(No. 2) an Address from Mr Consul Thurburn of Alexandria, to the members composing the committee of the Board of Health of Alexandria, upon being elected a member of the Board in September 1838.

Mr Thurburn has resided a number of years in Egypt, and has devoted a great deal of attention to the subject of our present inquiry, and his observations and experience are entitled to the highest respect and consideration. Mr Thurburn's address was referred by the Board of Health of Alexandria, to the supervision of the Supreme Board of Cairo, consisting of the surgeon-general of the army and several professors at the medical college. These gentlemen taking into consideration the great importance of the questions contained in Mr Thurburn's paper, and acting with the discretion which such a responsibility as they were about to incur demanded, associated themselves with several other medical men of undoubted character and talent, and the unanimous result of their solemn deliberation on this subject is the accompanying document (No. 3.)

## No. 2.

(1.) *Mr Thurburn to the Committee of the Board of Health at Alexandria.**Alexandria, Sept. 12. 1838.*

GENTLEMEN,—Having been elected a Member of the Board of Health at the late meeting of the Consular Body, I deem it incumbent upon me, before entering upon the functions of that office, to address to the other members of the Board some observations upon the duty devolving upon us, according to my view of that charge, in the present state of the establishment at Alexandria.

The Board of Health has now been constituted nearly seven years, and has formed a code of regulations for the performance of quarantine, and for the guidance of its officers in the execution of their respective functions. An honourable member of the Consular Body has also been appointed permanent commissary of the committee. The duties of the members of the Board of Health, as hitherto administered, are therefore brought within a very narrow compass; but the moment appears to me particularly favourable for the commission to extend its views to other objects of not less general importance in connection with the public health.

The primary object of this institution was the extinction of the plague in Egypt, and by the accomplishment of that, to establish a free pratique with Europe, or at least to obtain a considerable reduction in the period of quarantine. None of these objects has yet been attained, nor does the future hold out to us any better hopes of success by pursuing the system hitherto acted upon. Much has been done by our predecessors towards increasing the cleanliness of the streets; removing accumulations of filth; improving the construction and ventilation of the dwellings of the lower classes; making and clearing out drains, &c.; but notwithstanding the desire evinced by the local authorities to second the efforts of the Board, it must be confessed that we are still far removed from that healthy constitution of the atmosphere to which most of the large cities in Europe are indebted for that superior degree of salubrity which they now enjoy, compared with that of forty or fifty years ago. And since experience has taught us that plague does not assume an epidemic form without a general condition of the atmosphere favourable to its propagation, a wide field is still open for the exertions of the commission in endeavouring to diminish that atmospheric disposition, not only in Alexandria, but all over Egypt.

It is now generally admitted by medical men, that the plague presents itself, independently of the condition of the atmosphere before mentioned, and that, in that state, it is not more transmissible than other fevers common to the country. This is what is called the sporadic form of the disease; and I deem it my duty to call the attention of the committee to the consideration of the means best adapted for determining which of these two forms is the one existing in the country at any particular period; as in the event of this distinction being recognised, it will appear manifest that the same sanitary measures cannot with propriety be applied to circumstances so widely different.



General consent has already established the period at which the plague puts off the epidemic character in Egypt, as after the end of June, there are no examples of the disease continuing to exert any greater degree of malignity than other fevers peculiar to the season, and most of those who are attacked after that period recover under proper treatment.

The period when the disease appears under the epidemic form in Egypt, is not perhaps so well defined ; but from my own experience of upwards of thirty years in the country, I should say that it may be assumed not to commence before the beginning of January.

Should the Committee, after an examination of persons duly qualified to throw light upon this question, feel justified in admitting the classification of the disease which I now submit to their consideration, one of the consequences resulting from that concession would be the establishment of free pratique in the other ports under the Egyptian government from the beginning of July to the end of December, for all passengers proceeding from Egypt ; leaving the precautions respecting goods to be modified according to circumstances.

The revisal of the rule now in force, which prevents the issuing of clean bills of health till forty days after the last case of plague, would be another consequence of this new classification of the disease ; and here I may be allowed to observe, that instead of looking to Europe for instructions respecting the precautions to be adopted against that evil, the Board of Health in Egypt, from the superior means it possesses of ascertaining the peculiarities of the plague, ought to be looked up to by Europe as a guide in all such cases. No body of men ever enjoyed so many advantages for the prosecution of researches into the nature of the plague. Being perfectly independent, serving without emolument, and possessing, as we do, the entire support of the local authorities, I consider it a duty we owe, not only to the governments we have the honour of serving, but to the world in general, not to neglect the opportunities afforded to us by the frequent recurrence of the plague, of investigating, upon scientific principles, everything connected with that malady, in order to remove or confirm the doubts which exist respecting it—to ascertain whether the disease be endemic or of foreign importation—contagious or epidemic.\*

In the present age of physical research, the enlightened world will not be contented to receive as infallible truths the opinions of our forefathers, unless they can stand the test of scientific examination. And we cannot shut our eyes to the fact, that the contagious nature of the plague has been called in question by many of the most distinguished physiologists in Europe, and more particularly in this country, by eminent medical men, who, in addition to their extensive professional knowledge, have had unlimited practical ex-

\* A disease may be both contagious and epidemic at the same time. Mr Thurburn's meaning, I apprehend to be, Does the disease extend itself universally, by means of contagion, or does it not rather become epidemical through other causes which we do not at present understand, but which it is important to investigate ?

perience of the disease. The opinions of such persons cannot be treated with contempt by a commission instituted for the purpose of promoting the welfare of a numerous community, and it would be an honourable task for the Board of Health to enter upon the investigation with the assistance of such lights as those individuals may be able to throw upon the subject, and thus by an impartial, zealous, and unprejudiced scrutiny of facts, to set the question for ever at rest. There is no want in Egypt of enlightened and scientific men, fully qualified to second the exertions of the Commission in so noble a cause, and I trust that the valuable opportunities now within our reach may be so employed as to give to the labours of the committee some claim to the gratitude of mankind.

With a view to render the quarantine regulations less oppressive, I venture to call the attention of the committee to the determination of the question as to the utmost extent of time which an individual may carry about his person the elements of infection. An examination of this question in a place so favourably situated for such an inquiry, may point out the propriety of diminishing, without danger, the length of quarantine now prescribed for passengers; or of admitting them to the *spoglio* in a shorter period than is allowed by the existing regulations. At all events it must be admitted that there can be no plausible ground for subjecting a passenger and a bale of goods to the same period of expurgation; and whenever the rigour of quarantine can be mitigated consistently with a regard to the public health, our duty to the public requires that we should not neglect any opportunity of doing so.

Before concluding these observations, I must express my most decided opposition to all attempts at suppressing the plague, should it again appear here, by shutting up the houses where the disease has manifested itself. The horrors which attended the unsuccessful introduction of that practice during the epidemic of 1834 and 1835, when the Arabs were driven to bury their dead in their houses, or to throw them into the streets, in order to avoid the quarantine restrictions, have convinced me not only of the barbarity, but of the absolute folly of such measures. I was myself a member of the Board of Health at that time, and it has been a consolation to me to reflect that I had contributed to induce the government to discontinue that practice for the time.

I am aware that the cessation of the plague at Malta, in 1813, and latterly at Odessa, is ascribed by some individuals to the employment of similar means. In both cases, however, the disease ran its course for several months, and when it finally ceased, there is good ground for believing that its suppression was effected not so much by isolation, as by some change in the atmosphere, proceeding, as in Egypt, from natural causes, or by the enforcement of greater attention to the means of diminishing its pestilential condition, and by supplying the poorer classes with nourishing food.

In this opinion I have been strengthened by the fruitless result of all the means adopted with that intention by the Board of Health here since its organization, and more particularly by the report of

its operations presented on the 28th ult. at the general meeting of the Consular Body.

Having now briefly, though freely, stated my views with respect to some of the duties more immediately imposed upon a board of health, composed of Europeans, and established in Egypt, I have to express my readiness to lend my humble services, so far as may be consistent with those views; but should the present commission deem it incompatible with its mission to depart from the narrow line of conduct hitherto pursued by its predecessors, I must in that case decline the honour of continuing to form one of its members, from a conviction that my services could not be productive of any advantage either to the public health, or to the cause of humanity.

I have the honour to be, Gentlemen,

Your most obedient servant,

(Signed) ROBERT THURBURN.

(2.) *The Supreme Board at Cairo, to the Committee of the Board of Health at Alexandria.*

In conformity with the letter which you have done the honour to address to the Conseil de Santé, its members, Messrs Clot Bey, Del Signore, and Destouches, having engaged the co-operation of Messrs Duvignau, Pruner, Fischer, Perron, and Seisson, physicians and professors at the Medical College, they formed themselves into a commission, in order to reply as fully as possible to the questions contained in the memorial of Mr Thurburn, of which they have analysed the principal points, and reduced them to a series of seven questions.

The commission did not conceal from itself that these questions comprehend the most important and difficult points that remain to be decided in the present state of the science, and which would require immense labour and research to reply to them explicitly. The commission has deemed it proper to confine itself to a concise expression of its opinion, without entering into the elucidation produced during the course of the discussions.

*Reply to the Questions on the Plague, addressed to the Board of Health by Mr Thurburn.*

1. *Causes of Plague.*—All the general and particular causes of insalubrity of the country, are, in the opinion of the commission, only accessory causes of the plague; they cannot determine, but only favour its development, under the action of general influences, which constitute what is called epidemic constitution. In fact, the action of those causes is permanent, whilst the plague does not manifest itself epidemically, unless at periods more or less distant.

2. *Is the plague endemic or epidemic?*—The commission is persuaded that the plague is endemic in Egypt, as every year cases of plague occur in the sporadic state, and often with sufficient violence to occasion death in a very short time. The disease is sporadic when the general influences have little energy; it becomes epidemic when those influences are more intense and permanent.

The commission does not confine the endemicity of the plague to Egypt alone, and considers it to be equally endemic in Syria and at Constantinople.

3. *Period of appearance.*—All the world knows that the plague never appears under the epidemic form before the month of December, and at the latest after the month of March,\* and that it ceases at a period still more certain, that is, at the end of June.

4. *Mode of Propagation,—is it contagious or epidemic?*—We have already stated that the plague may appear under the epidemic form. With respect to contagion, as that is a question that cannot be brought within the compass of a brief summary, in consequence of the different shades of opinion entertained by each of the members on that subject, we refer the committee to the statements transmitted by each of us to Colonel Campbell, in reply to the queries addressed by him to us, and of which a copy has also been communicated to the Consul-General of France.

5. *Duration of the period of Incubation.*†—From the cases observed by all the members of the commission, it results that the period of incubation is generally from two to three days, more rarely five, but never more than six days.

6. *Reforms of which the Quarantine Laws are susceptible.*—Quarantines being established for the sole object of preventing the plague from penetrating into Egypt, the commission is of opinion, that if the plague is endemic in this country, they are of no use, since, even admitting the supposed importation of the disease, there would be required for its development the concurrence of the general influences of which we have before spoken, and which of themselves would be sufficient for its development without importation, for there are always in the country more elements of production than could be brought from abroad, viz. contaminated effects, and cases of plague. The inutility is still farther confirmed with respect to the importation from Syria, since it appears to be proved by the experience of every age, that the plague has never been introduced into Egypt from Syria.

7. *Seclusion or shutting up of the houses.*—The commission declares that the measures of seclusion are not only useless, but pernicious and inhuman, inasmuch as they spread terror among those who are exposed to them, and cause the people to evade them by violating all the laws of medical police. It is, moreover, sufficiently proved, that seclusion has never stopped the progress of an epidemic. Seclusion is one of the causes that promote the development of typhus, as it has the effect of keeping the individuals thus shut up, exposed to the effects of a vitiated atmosphere. The case of Giglio, so often brought forward in support of contagion, has clearly manifested the fatal consequence of seclusion, since among the numerous individuals who were in communication with the first one

\* In Egypt it must be remembered.

† I copy the French expression. They mean the time that the disease may be in the system of an individual without that individual being affected by symptoms of disease.

attacked, only those who were shut in the house fell victims to the disease, whilst two of his brothers, who had made their escape in order to evade seclusion, did not experience the least sickness.

The commission being persuaded of the good intentions of the consuls, is induced to hope for, if not the total abolition of quarantine in Egypt, at least the suppression of the more rigorous sanitary restrictions, and that we shall no longer see vessels, coming from ports where no plague exists, subjected to quarantine at Alexandria during the prevalence of an epidemic there.

The commission is of opinion, that the measure proposed by Mr Thurburn should be adopted for suspending all quarantine in Egypt during the season when the plague is not susceptible of assuming the epidemic character, viz. from the month of July to the month of November inclusively.

The members of the commission have the honour to be, with the highest consideration, your most obedient servants. (Signed) DESTOUCHES, OD. FISCHER, PERRON, DELSIGNORE, D. PRUNER, V. DUVIGNAU, CLOT BEY, SREISSON.

*Cairo, April 29th 1839.*

The only remark which I think in any way necessary to make upon the above documents is, to point out the singular and important coincidence in most of the views which have respectively been taken on the subject by the commission and myself. The gentlemen composing the commission at Cairo were engaged in drawing up their report at the same time that I was writing the one to which the present paper forms the Appendix. We have never had any communication with each other upon the subject, and to all but one of its members I am personally unknown. They have carried on their investigations at Cairo, and I mine at Alexandria, and yet in all points of any sort of importance we appear essentially to agree. This remark may appear attaching unnecessary importance to a trifling circumstance, but this would be taking an erroneous view of the case, for the almost perfect unanimity which appears now to exist among medical men who have personally investigated the subject, is in itself of paramount importance; and it remains to be seen how long the world will submit to be governed, upon this subject, by the superstition, prejudices and fears of former ages, when they have such testimony from such individuals, who, in place of speculating on sanitary laws and susceptible articles in the closet, have met the disease in the country to which almost every writer has imputed its origin, have there investigated the laws by which it is governed, and have come to such remarkable conclusions.

ART. IV.—*Account of a Case in which Two Fœtuses were united at the Sternum, with only one Liver and one common Heart.*

By R. U. West, Esq. Surgeon, Hogsthorpe, near Alford, Lincolnshire.

I was sent for on Sunday evening, August 15, 1847, at about six o'clock, to attend the wife of Robert Garfit, a coach-painter residing in this village. It was her fifth confinement, and she had always had easy labours. She stated that she had had slight pains the whole of the day, and I suspected, from her appearance, that she would have twins. Having ascertained, on a hasty examination, that the *os uteri* was well dilated, and having felt through the membranes one knee presenting, I at once directed my patient to go to bed.

When I came up stairs again, she remarked that she thought her "water had broken;" but on examining again, I found a set of membranes still presenting, which I ruptured, and then I felt, besides the knee above mentioned, two feet, neither of which belonged to it, and passing the finger higher up, I made out the foot belonging to the knee, and higher still the toes of a fourth foot. My conclusion, of course, was that this was a case of twins, in which all the four feet had got down together; and with regard to the two sets of membranes in which they ought to have been enclosed, I thought it probable that my patient had judged right as to the spontaneous rupture of one set, and that it was the other set that I had myself ruptured. Taking this view of the nature of the case, I did not anticipate the slightest difficulty; and telling my patient that she would "soon have it over," I passed my hand into the uterus till I reached the perineum of one fœtus, and thus making sure that the two legs I proposed to bring down first belonged to the same body, I proceeded with the delivery of fœtus No. 1. These two legs came down with no more than the usual very gentle traction, till the knees had cleared the vulva—the toes being turned towards the *os pubis*, when I perceived that a greater amount of traction was gradually becoming necessary. As I could still feel the legs of the other child near the perineum, I considered that this unusual bulk by the side of or rather behind the buttocks of the one I was attempting to bring down, was sufficient to account for a little increase of difficulty, particularly as the body of the second fœtus appeared to be in front of the first, and had therefore crossed it. All attempts to push these feet out of the way were unavailing, for the obvious reason, as I thought, that there was no sufficient prominence which could hold them back. I continued accordingly to use more and more force, until I was well able to grasp both thighs with a cloth.

What was the cause of the difficulty that was now beginning to be of serious amount? I was forced to conclude that the fœ-

tuses, by lying across each other, were somehow entangled ; that perhaps the head of the one had caught by the chin on the shoulder of the other. Once or twice a painful suspicion crossed my mind, that they were *united* ; but the reflection that I had always found it the safest course in obstetric practice to take the *most probable* as the solution of an unknown difficulty, compelled me to dismiss such a thought.

I now passed my left hand (the mother lying on her left side) along the back of the child, to reach, if possible, the cause of entanglement. I had hitherto been using the right. With considerable difficulty, I succeeded in reaching the left shoulder, but could not feel anything unusual there. I, however, managed to bring down the arm. After this, by grasping the thighs with both hands, and using very considerable force in traction, I brought the fœtus so low that the *cristæ* of the iliac bones were all but external to the vulva. I began to hope I should succeed ; but all my efforts to bring the child any further down were fruitless. It was like pulling at a tree.

I went to the foot of the bed, and introducing the left hand again by way of the perinæum, I tried what I could do by grasping the body of the child above its pelvis, while with the other hand I pulled at the legs ; but it was useless : and although my thumb and fingers seemed to pass nearly round the child I felt nothing unusual. The two fœtuses seemed jammed together, and it will be seen in the sequel that the attachment of the funis at the very point where the cause of the difficulty really existed, was very likely to prevent that cause from being detected in this stage of the delivery. For if the finger in passing between the children—jammed close together as they seemed to be—came in contact with any obstruction, the *tactus* must have been more than *eruditus*, which could have at once distinguished that that obstruction was caused by anything but the attachment of the funis alone.

I began to think it would be necessary to let the other two feet come, in order to bring the cause of entanglement, whatever it might be, more within reach : but I durst not venture upon such a bold plan ; for supposing the fœtuses to be separate ones, *as was most probable*, it would be unjustifiable, I thought, to do a thing so out of course as to allow the bodies of two full-grown children to occupy the pelvis at once. I was altogether so puzzled in mind and exhausted in body—(my hands, with nearly three hours' incessant exertion, being so much cramped, that now and then I could hardly grasp anything,) that I determined on having the benefit of a consultation and of a second pair of hands. I felt also that a divided responsibility would be very desirable.

I therefore desisted from any further interference beyond an occasional examination during a pain, while a messenger fetched

Mr Gilby from Alford, a distance of seven miles. Mr Gilby arrived in about an hour and a half, and made a careful examination, and then, after considerable deliberation, we agreed that the only proper course would be to persevere in the attempt to bring away one foetus at once. We then proceeded as follows.

While my friend held the legs of the foetus enveloped in a napkin, drawn down as far as he could, I passed the blunt-hook up along the back and endeavoured to get a hold somewhere. As it would not hold by the shoulder, I forced it through the back close to the spine, and got a firm hold by one of the ribs. I may mention that the funis had been prolapsed more than an hour, and had long ceased to pulsate. By this plan, Mr Gilby pulling at the legs, while I pulled by the blunt-hook—we, by using very considerable force, brought the body a little lower down, but we could not bring it away. The blunt-hook having dislocated the spine and broken two or three ribs, began to tear out. It was therefore withdrawn, and I was searching for another place to fix it by, when I felt what, without sufficient consideration, I took to be the second arm attached to the body of the child already half born. Without giving myself time to reflect that it was too thick, down I pulled it. This was a leg. I could not have been deceived,—it was certainly attached, in some way, to the same body of which the two proper legs had for some time been external to the vulva. I shall never forget my sensations at that moment. Without saying a word, for I half-feared I had done a foolish thing, I examined again and made out this time plainly enough that the two foetuses were united, and as far as I could reach I could not find out where they separated again. I directed Mr Gilby's attention to this most extraordinary circumstance, which at once explained the immense difficulty we had experienced, and we then sat down and looked at each other in almost mute astonishment. There was nothing else for it now but to let both the bodies come together. The fourth leg was readily brought down, and then the strangest sight we had ever seen in our lives was exhibited. They were united at the navel, abdomen to abdomen; and there was but one funis which passed upwards into the two bellies at the point where the union commenced. Both were females.

It is hardly necessary to observe that with the bodies of two full-grown children in the pelvis together, there would not be much room for any thing else. We made several attempts with the flat hand passed along the united bodies to feel the neck, or, if there were two heads, the necks, with the division between them; for, with such a strange sight before us, we could not tell whether there would prove to be but one head and neck or two.



But until we had drawn both bodies down a little lower, we could not pass our hands high enough. To make a little more room, while Mr Gilby held the fœtuses as low down as he could, I passed my right hand up the back of the second fœtus, which, it will be understood, was lying next the *os pubis*, and with much difficulty succeeded in getting down its left arm, though I fractured the humerus in doing it. This done, we were enabled to draw down the bodies so low, that we could ascertain that there were in reality two necks, and consequently two heads. We now decided on separating the fœtuses. I therefore passed a bistoury, guarded by the forefinger of my left hand, as high up the union as I could do with safety to the mother, and plunging it in, brought it out again at the united umbilicus. We perceived that a large mass of liver had been cut into. This we tore away along with nearly the whole of the intestines belonging to both children. By so doing we diminished the bulk occupying the pelvis so much, that we were enabled to draw the bodies down a good way further. I have said the blunt hook had divided the spine, and made a considerable hole in the back of the first fœtus; and now that an incision had been made, which opened its abdominal cavity, this child was so nearly in two, that at any rate it was not likely to be of any further use for traction. We therefore agreed that it would be better out of the way; so it was cut off and laid aside. The sequel will show that it was a fortunate circumstance that there was only one body left to make traction with.

It was now our object to bring the bodies low enough to enable us to complete the separation, and afterwards open one of the heads if it should be necessary. This could not be done with safety to the mother, until the upper part of the united chests was brought nearly clear of the *os externum*. For the pelvis was filled so tightly, that it was almost impossible to pass the finger as a guide to the bistoury, and the more so, as the mass remaining to be divided being the upper ribs and the sternum, could not be pressed down like the soft yielding abdominal junction. I therefore passed the blunt hook up between the children, and got a firm hold at the top of the junction, and while Mr Gilby again grasping the pelvis of the second child, made powerful traction with both hands, I made equally powerful traction with the blunt hook. After two or three efforts of this kind, a violent expulsive pain coming to our assistance, the two heads, to our great delight, came suddenly away together, and complete delivery was effected.

Now it has been mentioned that there was only the body of the second child left to pull by. This kind of traction brought the head of that fœtus below the chin of the other, the extent to which they had been divided having enabled the remaining undi-

vided portion to stretch sufficiently to admit of this favourable change of position. Thus the heads, in point of fact, passed through the pelvis one after the other. Figure 1 will show more distinctly than I can explain in words how the *foetuses* were expelled.

There was a good deal of hæmorrhage after the birth of the children, and in two or three minutes the one placenta was without any difficulty extracted. The labour was over a little before midnight. The perinæum was uninjured, and the mother has recovered without a single bad symptom.

I proceed now to a description of this remarkable freak of nature, and to a detail of such anatomical peculiarities as I have had the opportunity to investigate. The appearance presented by it was that of two perfectly formed and well-developed female children united from the umbilicus to the necks. They weighed, without the enormous liver and those portions of the intestines which were torn away,  $11\frac{1}{4}$  lbs. avoirdupois; and estimating the weight of the parts removed and of the blood that was lost at a pound and three-quarters, I think we may safely assume, that they would have weighed, if entire, 13 lbs., which is two pounds more than the average weight of twins according to Burns. The union at the top was formed by a common sternum, or rather by the clavicular extremities of two sterna united end to end, and passing nearly straight across. This double sternum was very short, and would, if removed, have presented the appearance of a nearly square piece of bone with a clavicle at each of the four corners. A kind of raphé could be felt at the point where the bits of sternum joined each other. Below the sternum on both sides, the true ribs were united by short pieces of cartilage which ran straight across from the ribs of one child to the corresponding ribs of the other. The cartilages of the false ribs turned upwards, and were attached to the under part of the cartilages of the lowest true ribs.

The liver having been cut nearly in two, and torn away along with nearly all the intestines, it was impossible to ascertain the relative position of the parts in that portion of the abdominal cavity in which the sac of the peritoneum was common to both *foetuses*. I have said there was but one umbilical chord, and as that was not at all thicker than the average, I imagined it possible that the children might each supply only one umbilical artery; but on examining the iliacs in one of them, I found that each iliac sent off its artery in the usual way. The aorta of the other *foetus* having been cut in two in the situation where the blunt hook had divided the spine, had been torn away along with both kidneys; but there could be no doubt that this child supplied two umbilical arteries as well as the other. The chord must therefore have contained four umbilical arteries; but for various reasons, which will be more apparent when I come to the description of the heart, I

think it probable that there was but one umbilical vein. I regret that when I was searching into these matters the day after the delivery, the whole of the funis, as well as the placenta, had been made away with by the nurse.

Attached to the under part of the raphé of the common sternum, which formed a kind of roof to the two chests, was a membranous bag extending across from side to side, and down to the diaphragm. On cutting into this, I found it was a pericardium containing a curiously-shaped heart, common to both *fœtuses*. Passing the finger along the top of this heart, I found that its only attachments were at each side, the middle part for the space of about two inches being free. Flat and shaped like a kidney, it seemed to lie evenly between the two chests; but by stretching it downwards, it assumed some obliquity, which I found was occasioned by the circumstance that each upper corner of the heart was connected with the right side of each *fœtus*. Each child had a complete pair of lungs, three lobes on each right side, and two on each left, the mediastina extending backwards from the centre of the common pericardium. Two thymus glands were attached to the under part of the sternum, separated from one another by the pericardium. Each *fœtus* had two kidneys, and the pelvic viscera in both were perfect and well-developed. Although the liver was much torn and nearly cut in two, I was yet enabled to make out distinctly that it was a large one, common to both children. I could not find any gall-bladders; but probably there would be two; at any rate, there must have been two ducts, one for each duodenum. The diaphragm was torn to shreds.

I have said that as the heart hung loosely in its pericardium, it was placed evenly between each thorax, and that it was attached to the right side of each *fœtus*. This circumstance was rather puzzling at first; for it has an aorta at each upper corner, rising from a kind of ventricle immediately underneath it, so that the systemic ventricle of each individual would be in fact a *right* ventricle, and not a left one with reference to the *fœtus* to which it belonged. But the fact is, that in the natural state of things, the *aorta* arises on the *right* side of the heart, to the *right* of the pulmonary artery, on the *right* side of the thorax, and passes across the spine to the left side; and that, notwithstanding its ventricle lies somewhat to the left, but more behind the heart. Therefore as the *aorta* must arise on the right side, it seemed a kind of necessity that, constructed as the heart about to be described is, each systemic ventricle should be situated on the right side of the *fœtus* to which it belonged.

So much for position. The heart itself is shaped like a kidney, and weighs exactly one ounce avoirdupois. On external examina-

tion it is found to possess the following peculiarities: One enormously large auricular sinus (Fig. 1 and 2) having two openings into it at one corner, supposed to be the openings for a common superior and inferior *vena cava*, with five auricular appendages, one very large under the openings for the *cavæ*, two at the other corner looking like another large one split in two, and two smaller ones near to each other, hanging down on the other front of the heart between the roots of the two aortæ,—all these appendages communicating internally with the large auricular sinus. An aorta at each side of the heart, and a single pulmonary artery having its root near, and passing under, that aorta which is situated nearest the openings for the *cavæ*. These three vessels are all furnished with semilunar valves. No traces of pulmonary veins can be found.

An incision along the top of the auricular sinus, and down one front of the heart into the middle cavity, exposes nearly the whole internal structure. In the middle of the floor of the auricle is a large opening into a kind of ventricle. Round this opening, four valves, of the kind called *tricuspid* or *mitral*, but not properly called either in this instance, hang down into the ventricle. A director passed into the pulmonary artery enters this ventricle, under the valve numbered (2) in the sketches. The valve numbered (4) is tied down by its *columnæ carneæ* to a thick muscular *septum ventriculorum*. The valve numbered (3) is tied down to another set of *columnæ carneæ*, which form the only division between the middle ventricle and the systemic ventricle on that side,—the two ventricles communicating freely with each other between these muscular columns. A large rounded hole is found in the upper part of the septum, lying between the middle ventricle and the other systemic ventricle. This hole is under the valves numbered (1) and (4), and through it there is a free communication between these two ventricles. Thus it seems that, in point of fact, all these three ventricles are as one. The two systemic ventricles, on being cut into, are found to have no communications with any thing but with the middle ventricle in the way just described, and each with its aorta. No traces of mitral valves can be found in either of them, and they are not needed, for their proper auricles are equally wanting; and the most careful search can detect nothing like pulmonary veins, though I am inclined to suspect that the openings marked (i) in figure 2, which terminate in a small cul-de-sac in the muscular wall of the heart, are abortive ones.

Thus this heart may be said to consist of but one auricle for the admission of blood, and one ventricle for its expulsion by means of three arteries. It is evident, therefore, that, though it might do very well to support *fœtal* life, even for both children, it could not have supported extra-uterine life for more than a few

minutes. The blood might be sent by the common pulmonary artery to both sets of lungs, but it could not come back again. If the septa between the ventricles had remained incomplete, black blood would have been sent out by each aorta to the general system, as well as by the pulmonary artery; and if, by any means, the septa had been made complete, as in the case of the closure of the *foramen ovale* in the perfect fœtal heart, the systemic ventricles would have been useless, as they could not have been filled.

Now, as there appears to be but one common auricle and one common pulmonary artery, is it not probable that the ascending cava of each fœtus, if they could have been examined, would have been found to have united in a common trunk before passing through the diaphragm? Is it not also probable that there was but one portal system? And one ganglionic system? But speculations of this kind resting on probabilities can hardly add to the interest of a case, in which the facts capable of demonstration are quite strange enough in themselves.

A few remarks in further explanation of the difficulty of arriving at a correct diagnosis before the third leg came down, seem to be needed, and will be now intelligible after the above description. Carefully avoiding the second pair of legs, and endeavouring to act only upon the body of the first child, with the left hand along the back, I could obviously detect nothing unusual. But, in seeking the belly, the right hand, passing over the pelvis of the first child, would arrive first at the insertion of the funis, from which it would retire cautiously; it would then pass up by the side of it, and would arrive at the cartilages of the ribs, where the two bodies were united; but this part would feel exactly like the *scrobiculus cordis*, the ribs going away in both directions as in a well-formed single fœtus. Thus, even in seeking the belly, whether the hand passed this way or that, it would still seem to touch only the body of the first child; and although it might continually be in contact with nearly the whole length of the union, no correct appreciation of the undue bulk of the whole body being possible, from contact with only a part of it at once, the general impression would be, that the hands had at different times touched every part of the circumference of the child without detecting anything unusual,—that on whichever side the hand was, the body of the other child was always on the further side,—that the two bodies were jammed or entangled together in some unaccountable way above the reach of the fingers,—and that the whole affair was very puzzling and embarrassing.

On the mode of procedure to be adopted in cases like that now described, Madame Boivin gives the following directions, which exactly accords with the management which I adopted in the early stage of the delivery.

"When the lower extremities of two foetuses present at the same time, it is requisite to introduce the fingers into the uterus to a sufficient depth to be satisfied that the two extremities belong to the same infant; and while traction is made upon the legs of the one, the accoucheur must push back the *nates* of the other above the superior outlet."\*

Before concluding, I have only to mention that, in the Edinburgh Medical and Surgical Journal for April 1840, there is recorded from Schmidt's Jahrbucher, as occurring in a boy of 9, with cyanosis, a case in which the heart presented a malformation resembling part of the heart of the double foetus in the instance here recorded. "The fleshy septum common to the two ventricles did not reach quite to the base of the heart, but was deficient at that point close to which the aorta originates, leaving a circular communication between the two ventricles.†

*Note.*—Would the manner in which delivery was effected in this case explain the way in which the Siamese twins were born? They were merely connected by a fleshy band passing between them. This band might easily be drawn in such a direction as to admit of one head passing under the chin of the other.

R. U. WEST.

*Hogthorpe, near Alford, Lincolnshire.*

*August 27, 1847.*

*Description of Plate XV.*

Fig. 1 represents the manner in which the heads passed through the pelvis.

Fig. 2 shows the whole length of the union, and the attachment of the funis.

Fig. 3 shows the union at the sternum, the heads drawn back.

Fig. 4, one front of the heart, actual size.

Fig. 5, the other front of the heart.

Fig. 4 and 5. *a.* Aorta coming this way.

*b.* Aorta turning over the other way.

*c.* Pulmonary artery.

*d, e, f, g, h.* The five auricular appendages.

*i.* Supposed abortive pulmonary veins.

*k, k,* Supposed entrances of *venae cavae*.

*l.* Enormous auricular sinus.

The dotted lines shew the direction in which probes passed through the aorta and pulmonary artery enter the heart.

Fig. 6, Plan of the floor of the auricle.

Fig. 7, Inside of auricle and of middle ventricle.

Fig. 6 and 7. *1, 2, 3, 4.* The four auriculo-ventricular valves.

*d, e, f, g, h.* The five auricular appendages.

*m, n.* Openings into appendages *f* and *e*.

\* Memorial de l'Art des Accouchemens, par Mad. Boivin.

† Ed. Med. and Surg. Journal, Vol. liii. p. 523.

- o.* A little muscle, free in its middle, between the openings.
- p.* Round hole into systemic ventricle of that side.
- q.* *Carneae columnae* through which is the communication with the other systemic ventricle.
- r.* A director passed through the pulmonary artery enters middle ventricle under valve 2.
- s.* Probe holding up valve 2.
- t, t.* Dotted line showing commencing of auriculo-ventricular opening.

N. B. In Fig. 6, the valves are supposed to be raised.

ART. V.—*Case of Peritonitis with Purulent Effusion. Spontaneous evacuation of pus through the abdominal parietes. Recovery.* By C. J. B. ALDIS, M. D., Cantab., Fellow of the Royal College of Physicians, London, Physician to the Metropolitan Free Hospital, and Lecturer on Medicine.

As the following case is one of unusual occurrence I have been induced to submit it to the notice of the profession.

Susan Bagg, aged 7 years and 4 months, residing at 17 Carter Street, Brick Lane, was admitted under my care, at the London Dispensary, on June 1st 1846. I visited her for the first time on the 5th with Mr Lewis, a medical practitioner of Brick Lane. The pulse was quick; the tongue clean; the motions were reported natural; and the urine scanty. The patient lay upon her right side; the face being much emaciated and pinched. The countenance was anxious, and the upper and lower extremities were greatly emaciated. The abdomen was greatly distended, with umbilical protrusion, and distinct fluctuation. We observed a small swelling with very thin *parietes* midway between the margin of the ribs and umbilicus on the right side.

About 11 weeks previously the child had been attacked with chilliness, followed by heat and vomiting, with pain in the abdomen. On the day after her seizure she became delirious, and in about four weeks the tumefaction of the abdomen was first observed. Fever accompanied these symptoms, previous to which she had been attended by Mr Lewis for pleurisy. A careful examination of the abdomen was then made. No induration or enlargement of the liver could be detected; in fact no enlargement of any of the abdominal viscera could be distinguished. The parts around the small swelling alluded to above were soft and yielding; it did not appear to be connected with any of the intestines, and the motions never contained purulent matter. The father of the patient had measured the circumference of the abdomen when it first became distended, and stated that its dimensions amounted to thirty-one inches.

With regard to the diagnosis of this case, I considered it to be

*peritonitis* with effusion, and that the small swelling forming in the abdominal parietes was an effort of nature to evacuate their contents. The urine had somewhat increased after the employment of a mixture ordered by Dr Pridie on June 1st, consisting of three drachms of spirit of nitrous ether, two scruples of carbonate of magnesia, and six ounces of camphor mixture. Of this one tablespoonful was prescribed every six hours.

These remedies were continued and a poultice applied to the swelling.

8th. About five quarts of purulent matter escaped yesterday through a perforation of the abdomen, occurring naturally in the swelling between the margin of the ribs and umbilicus, after which a proportionate diminution of the abdominal walls supervened. The abdomen was then uniform in appearance, still swelled, with fluctuation all over it; but no tumour nor remains of a cyst can be traced. The patient complains of soreness in the hips. The urine tolerably abundant and clear; slight cough.

The patient was directed to take every sixth hour half an ounce of the nitre draught, with ten minims of spirits of nitrous ether, and at the same time a pill of squill and mercury.

12th. Discharge from the opening in the abdomen continues, and the belly has now become flat. The patient has been out of bed daily since the 8th for four or five hours.

Remedies continued.

15th, Friday. When I visited the patient this day she was eating bread and meat with a keen appetite. The countenance is much improved; has left her bed daily for six or seven hours; can lie on either side. Pulse quick; bowels open; urine not albuminous. On Tuesday morning about a cupful of purulent matter escaped from the orifice, and the discharge continues.

Remedies continued.

19th. The symptoms are much the same as at the last report.

The patient was ordered to take half an ounce of the gentian draught, with twelve minims of spirit of nitrous ether three times daily.

29th. A copious discharge oozes from the abdomen; tongue clean; bowels open; motions knotty occasionally; no tenderness; but the abdomen is still swelled.

Two drachms of castor oil were directed to be given.

July 3d. The discharge continues to be very abundant. Tongue clean; bowels open; urine free; pulse quick; skin hot; vomited three times this morning.

An effervescing draught, with fifteen minims of spirit of nitrous ether, was directed to be given three times daily; and the castor oil to be repeated.

6th. Complains of weakness; vomiting much less.



## Remedies continued.

13th. The discharge continues, but is more watery ; health and strength improved ; can walk across the room.

20th. Came to the dispensary, where she was seen by Mr Gayton the apothecary and myself. The discharge still continues, and pressure on the left iliac region increases the discharge. She is, however, gaining flesh ; the tongue is whitish with a red streak in the centre ; the pulse small and quick.

## Remedies and treatment continued.

23d. Attended again at the dispensary ; improves in strength ; is able to walk up and down stairs by herself ; tongue clean ; bowels open ; motions natural ; urine free ; pulse quick ; skin cool.

## Remedies and treatment continued.

31st. Improved in appearance ; about three quarters of a pint of discharge came away the other day ; it still continues, but in smaller quantity. The abdomen measures twenty inches in circumference over the umbilical region. Tongue clean ; bowels open ; urine not so free.

## Treatment continued.

She was subsequently seen twice by Dr Bentley of Trinity Square, who ordered a continuation of the medicine.

Sept. 14th. In consequence of the patient neglecting to attend the dispensary, I visited her at home, and found that she was in perfect health, plump in appearance, and employed at silk dressing, after which she usually played about the streets, a cicatrix having formed in the place from which the discharge had originally issued.

*Remarks.*—The preceding case is in many points interesting. In the first place the unusual occurrence in children of such a termination of peritoneal inflammation as a natural orifice in the abdominal walls, is to be noticed. We occasionally meet with cases of partial peritonitis, in which abscesses are formed, and the purulent matter is evacuated by stool. In these cases the pain is more circumscribed and the abdominal swelling less uniform ; but an instance of general peritonitis in children causing an aperture in the abdominal walls with escape of purulent effusion through them, is, I believe, exceedingly rare. I have consulted many practical writers on the subject, but they do not publish similar examples ; the experienced members, however, of the Medical and Chirurgical Society may be able to furnish analogous cases. Secondly, the prognosis of such a case is very important. The opinion of any medical practitioner would, I believe, have been most unfavourable in regard to the result, from the extreme emaciation of the patient, the rapid state of the pulse, the great enlargement of the abdomen, all of which symptoms had supervened upon an attack of perito-

nitis, commencing eleven weeks before, and proceeding without any relief of the symptoms, when nature kindly gave an indication of the mode of cure. It is also to be remembered that, immediately before the attack of peritonitis, the patient had been attended during some time by Mr Lewis for pleurisy. One physician who saw the case told me that he looked upon it as a severe case of dropsy, and that she would sink in a day or two. It is encouraging to reflect, that persons may recover even from the most untoward circumstances; and the above case will point out the advantage of paracentesis, effected in this instance by nature, even when the prognosis may be most unfavourable in peritoneal inflammation affecting children. Dr Robert Lee informs me, that he has met with several cases of puerperal peritonitis terminating as the above one, but has never met with a similar instance in children.

ART. VI.—*Notes on the Practice of Shoda.* By GEORGE W. BALFOUR, M. D., &c., Corstorphine. Read before the Medico-Chirurgical Society of Edinburgh, June 23d 1847.

“Mais, si la nature joue ici un si grand rôle, qui ne sait que, pour apprécier le rôle que peut jouer la medication, soit qu'elle nuise, soit qu'elle soit utile, il est nécessaire qu'on rassemble et qu'on soumette à une sévère discussion une collection de faits beaucoup plus nombreux que les nôtres, afin que, les mêmes résultats se reproduisant un grand nombre de fois, on puisse défalquer en chiffres ce qui, dans ces résultats, appartient à la nature et ce qui appartient à l'art?”—*Andral*.

THE object of the few following observations is to explain the practice of one who, without disregarding the aids of science, pays some attention to the phenomena of nature; and to contrast it in some respects with that of others.

Dr Joseph Skoda, well known for his researches on auscultation and percussion, has had for some years past the charge of the clinical department for diseases of the chest in the Royal and Imperial General Hospital, Vienna. This consists of one ward for males and one for females, each containing about 20 beds. He has also under his charge three other wards for miscellaneous cases. Over the admission of these patients he has no farther control than a right to demand all well-marked cases of chest complaint, so far as his accommodation permits. This tends to fill the clinical wards with severe cases, which are there uncereimoniously lectured over, subjected to percussion, auscultation, and examination, by the students at least twice every day. From these wards the following statistics of chest complaints have been obtained.

*Pneumonia.*—On first entering on his duties Dr Skoda treated

this disease according to the most approved principles. He drew blood from the system; leached and blistered freely; giving at one time tartar-emetic in various doses; at another employing mercury equally freely. Becoming, however, sceptical as to the amount of benefit derived from such heroic treatment, he gradually left it off; and now nauseants and mercurials are equally unknown. Leeches, cupping-glasses, and blisters are never employed, and general bleeding only where the fever runs high, and the dyspnoea is great, previous to hepatization. After this has occurred, he regards the abstraction of blood as injurious, diminishing the chance of a speedy and complete absorption of the exudation. If dyspnoea or cyanosis be occasioned by a secretion of tough mucus, an emetic is given. His general treatment consists in giving a scruple of *Extractum graminis, ext. Glycyrrhizæ*, or some other equally innocuous extract; from ten to twenty grains of nitre, or latterly a quarter of a grain of corrosive sublimate, by way of attempting to reduce the plasticity of the blood. These remedies are dissolved in from six to eight ounces of water, and given, often warm, in the course of the day. From six to eight grains of Dover's powder are occasionally employed, or a grain or two of opium is given, according to the amount of pain and irritation present. Many patients are treated wholly without opium. All have a thick warm cloth (umschlag) laid over the chest. The temperature of the wards is about 60° F. summer and winter; and though well aired during the former season, they are close and ill-ventilated during the latter. The diet is in conformity with the habits of the people, and not more rigid than in other hospitals.

This method of treatment has been pursued for the last three years, and its results will be seen, by reference to the table (No. 1), to have been most satisfactory. During a period of three years and five months 392 patients were treated, of whom 54 died; giving a mortality of 13.7 per cent., or nearly 1 in 7, showing for hospital patients a particularly favourable proportion of recoveries. In the Edinburgh Infirmary, where a more heroic treatment is pursued, the statistics of pneumonia, as contained in the reports of Drs Reid, Peacock, and Bennett, from 1st July 1839 to 30th September 1844, being a period of five years and three months, give 253 patients and 91 deaths; being a mortality of 35.9 per cent., or 1 in 2.78. This is perhaps the highest mortality from this disease in Scotland; as from some statistics given by Dr Thomson (Ed. Med. and Surg. Journal, No. 156), and by Dr Orr (op. cit., April 1847), the average mortality from pneumonia in the Scotch hospitals would seem to range from 1 in 3 to 1 in 4, still nearly double that of Skoda. The patients are of a similar rank in life; their average age must be nearly the same; and intemperance and chronic disease form equally frequent

complications at Vienna as with us. Something may be due to the influence of climate. That of Vienna is drier and steadier, but subject to greater alternations of heat and cold than our own.

Again, our patients are not unceremoniously lectured over, subjected to percussion and auscultation as Skoda's are. That this has its influence seems to be the inference deducible from the following facts:—In the Edinburgh statistics there are 176 males with 64 deaths, 36.36 per cent. or 1 in 2.75; and 77 females with 27 deaths, 35 per cent. or 1 in 2.85; the mortality being thus nearly equal in both sexes. In Skoda's statistics there are 307 males with 36 deaths, 11.4 per cent., or 1 in 8.5; and 85 females with 18 deaths, 21 per cent. or 1 in 4.7; the mortality amongst the females being thus nearly double that amongst the males. Now, as the non-employment of evacuant and weakening measures, ought *à priori*, to tell more favourably on the weaker sex; and as the only other material difference in the treatment of the two sets of cases is the aforementioned percussions and lecturings to which Skoda's patients are subjected. To this the increased mortality amongst the feebler sex must undoubtedly be referred; and though most obvious in the one sex, we cannot but suppose the general mortality of both to have been thereby materially increased. The foregoing figures would also seem to show that pneumonia is a more frequent disease amongst males than females; the proportion in the Edinburgh cases being 2.7 to 1, in Skoda's 3.6 to 1.

The average residence in hospital of the Edinburgh cases ranges from 19 to 26 days, the general average being 22 days, and we all know the weak and emaciated state in which such patients are too frequently discharged. The residence of Skoda's patients in hospital is, from the nature of the regulations\* (vid. Wilde's *Literary and Scientific Institutions of Austria*), often protracted; but from personal observation, I can state that in a period varying from 10 to 12 days all treatment is discontinued, the normal physical signs are re-established, and the patient is as well as before the attack. While ill he bears the full force of the disease, and often seems to suffer much from pain and dyspnoea, but the disease having once begun to give way, which it is seldom later of doing than the seventh or eighth day, the rapid resolution of the hepatization and speedy restoration to health is most striking. Sometimes in 24 hours the respiration will be found to have passed from pure bronchial to puerile vesicular, and in a few days the patient is as strong as if he had never been ill. Nor are relapses more frequent than under a different treatment; perhaps less so.

In support of Skoda's opinion, that even when seen early, active treatment, as venesection, &c. is in most cases unnecessary, I may state that, in going over the reports of his cases, I found

that those admitted in the first stage rarely had a severe disease, though in all probability the primary symptoms had been so, having induced them thus early to seek for relief. This applies more especially to the disease as found with us; for by the first stage, I mean, of course, that of which the fine crepitant râle is the diagnostic mark; but this stage is amongst the Viennese patients very generally wanting, (vid. Skoda's *Abhandlung über Perkussion und Auskultation*, s. 255, note,) the respiration passing at once from pure vesicular to undecided or bronchial, rendering thereby the employment of active measures still more doubtful.

*Pleuritis.*—The cases comprehended under this head are chiefly chronic or subacute, with a few acute ones, frequently occurring as part of a local or general tubercular process. The treatment consists of those measures already described, blood-letting being practised under similar restrictions, and baths and purgatives employed in those chronic cases complicated with effusion. During the year ending June 1846, there were 29 males admitted, 5 of whom died and 3 remained; during the same period 4 females were admitted, 3 discharged cured and 1 improved, giving on the entire dismissals an average mortality of 16.6 per cent. or 1 death in 6. The Edinburgh statistics give for five years and three months,—pleuritis, chronic and acute, a sum of 156 patients with 21 deaths, 13.46 per cent. or 1 in 7.4. This is for a series of years, and the cases are chiefly acute; still the discrepancy is not very great; and Skoda has the merit of using a simpler method of cure, as an undoubted saving to the constitutions of his patients. I may state that I have seen one or two cases treated with mercurial inunctions alongside of others treated as above, and never observed any difference except what was due to the manifestation of the physiological action of the drug. Indeed in one case the recovery seemed to be as much retarded from this cause as I have seen it in the homœopathic hospital from the total absence of treatment.

With respect to the more chronic diseases of the lungs, as tubercular phthisis, broncho-blennorrhœa, emphysema, &c. they run their course much as in other hospitals, though from the non-employment of judicious palliatives the more distressing symptoms, as cough, &c. often harass the patient much. Though indubitably merely under the influence of rest and diet many of the symptoms are relieved, the working of the imagination is frequently obvious—a slight change in the dose or manner of prescribing it (as *grana viginti*, instead of *scrupulum unum*\*) often acting like a charm. This method of working on the minds of his patients is frequently practised by Skoda.

\* The prescriptions are recited aloud by the physician, and copied by a clerk upon a board hanging at the bedhead, containing the patient's name, disease, &c.

The various *heart complaints* are relieved by rest, diet, and some innocuous placebo, quite as effectually as they are in our hospitals by bleeding, digitalis, &c.

*Pericarditis*, like other acute inflammations, runs its course without active treatment. Plastic effusion, as indicated by a friction sound, does not take place more frequently than in cases more actively treated.

In the wards for miscellaneous cases, consisting of two for males and one for females, the prevailing diseases are tuberculosis of the lungs and other internal organs, and fever. This latter is divided into two great classes, gastric fever and typhus. The first comprises a great number of cases from the slightest febrile disturbance of the digestive organs up to what would with us rank as continued fever; few or none die. The treatment consists of diet, occasional purgatives, and some placebo.

*Typhus abdominalis* is a more formidable complaint. It will be seen from the table (No. 3,) that for the first 7 months of 1846 the mortality was 28.9 per cent. During the year 1845, 145 patients were treated, of whom 80 were discharged cured, 4 relieved, 3 transferred to other wards on account of special diseases co-existing or arising subsequent, and 43 died, giving a mortality of 33 per cent. and for the year and 7 months an average mortality of 31 per cent. or nearly 1 death out of 3, five times as great as the average mortality in Great Britain from continued fever, (vid. Dr Arthur Thomson's Statistical Inquiry on Fever, Ed. Med. and Surg. Journal, No. 136. Statistical Tables of the Royal Infirmary, Edinburgh, by Dr Bennett, &c.) yet even under this general head the mortality is often much higher, and in Edinburgh alone, from 1st July 1839 to 30th September 1842, ranged from 1 in 6 to 1 in 7. Chomel (Leçons de Clinique Médicale) gives 47 deaths out of 147 patients admitted with *typhus abdominalis* into the clinical wards of the Hôtel Dieu, 31.9 per cent. or 1 death in 3.

Skoda's apparently great mortality appears to be due to the strictness of the diagnosis. His treatment consists in the administration of mineral acids in scruple doses daily; occasional purgatives if required; frequent sponging with vinegar and water; the use of opium, chiefly *per enemata*, in the later stages when diarrhœa sets in, and the employment of compresses dipped in iced water applied to the head in cases where a determination to that region is indicated by delirium, &c. Wine is allowed if necessary; and during convalescence the diet is progressively improved, but tonics are rarely given. The abstraction of blood, topical or general, the employment of blisters, chlorides, &c. are equally unknown. The treatment has at least the advantage of simplicity.

Cases of *cerebral apoplexy* occasionally occur, and recover perfectly without bleeding; rest and diet being sufficient; they are as a rule accompanied by hypertrophy of the left ventricle of the heart.

Cases of *tonsillitis* are treated with the inhalation of steam, and recover perfectly in a day or two. I have seen some very severe ones, and never saw this treatment fail, nor a single case of suppuration.

Having elsewhere enlarged on his treatment of *peritonitis*, *intermittent fever*, and *dysentery*, and having nothing to add, I think it unnecessary to recapitulate here. (Vide British and Foreign Medical Review, No. xlv. p. 577, and No. xlv. pp. 607-608.)

From the foregoing remarks, it would seem that acute inflammations, merely placed under favourable circumstances, have a shorter duration, and more frequently a favourable termination than when more heroically treated; but making every allowance for climate, and any slight difference in the character of the disease and the constitutions of the patients which may exist, it cannot but be granted, that, let alone, they run their course at least as favourably as in opposite circumstances, at a saving of strength to the patients. In support of this we have the testimony of homœopathic practitioners in every country; many of them men of skill and talent, whose word we have no reason to doubt, though we may deem their conclusions erroneous, and surely now-a-days, when, in pneumonia, for instance, it is universally granted that there are many cases which do not bear bleeding, in which a trial of the contro-stimulant plan has been recommended on the strength of two or three imperfectly reported cases that have recently occurred in France, (vide Edinburgh Monthly Journal of Medical Science, March 1847, p. 708,) surely more than 300 successful cases call still more loudly for a trial of this natural eclectic system. The age has gone by when the use of our reason in the practice of medicine was deemed heretical and dangerous. Why should we bleed and physic merely because our forefathers did it? Far from opposing active treatment, I would desire to see it placed on a firmer basis, put in force on substantial and pathological grounds, and not in the present hap-hazard method, which I believe to be worse than useless; positively dangerous. Those attached to heroic practice often blame nature unjustly,—blinded by the equivocal results of their own short-sighted policy, they know no better;—called to some case mistaken for *febricula*, they vituperate nature for the amount of disorganisation present, forgetting, that, had she proved equal to her task, they never would have seen the case. It would have passed for *febricula*,—knowing but too well the like could never have oc-

curred in their own practice. The patient would long before have sunk under the united efforts of disease and the doctor. Such men ought to examine homœopathic practice more closely; the spread of correct pathological doctrines (would we had them); a better knowledge of disease and its progress will rapidly thin the ranks of such men.

It must not be thought that because Skoda and his statistics belong to Vienna, they therefore belong to a country where pneumonia, &c. has lost its sthenic character; has reached that point in which to bleed were murder. On the contrary, there, as here, disease is undergoing a gradual change, and with it men's opinions. I have been told by one of the most talented medical officers of the hospital, Dr Sigmund, that he had been assured by men in whom he placed implicit confidence, that formerly acute diseases bore well, nay, required large bleedings. But he was well assured that now at least the case was altered. Why then continue a practice suited to a different state of matters? There, as here, the older practitioners stand upon their experience and early recollections, and scout at the present tendency of medical reform. There, as here, they bleed, and bleed largely, and, I believe, with very tolerable results as to mere recoveries. Indeed Skoda himself has often told me he did not consider his semi-expectant system more conducive to recovery in the mere point of numbers, but that at least as many got well as under other systems, and that much more speedily and with less loss of strength. They are consequently sooner able for the active duties of life, and less liable to chronic disease. Is that such a trifle as to be nought in the balance of truth against the weight of experience? Experience, forsooth, which may be claimed for any old woman's cure, what can be more fallacious than experience untested by reason? Almost all the discoveries and reforms in medicine have been contrary to it. What wonder, then, that this is? The advocates for heroic practice should pause then and think. "*Nam ut sanguis semel missus nunquam in venas, redit, sic neque vires cum illo amissæ in variis morbis unquam refici possunt.*"—Gregory's Consp. Med. Cap. XL. MDLXXX.

TABLE, No. I.—Pneumonia.

| For 34 years,<br>beginning<br>with 1843.<br>1843. | Rem.<br>from past<br>month. |    | Admit-<br>ted | DISCHARGED. |     |     |     |          |     |    |        | Remaining<br>to next<br>month. |  |
|---------------------------------------------------|-----------------------------|----|---------------|-------------|-----|-----|-----|----------|-----|----|--------|--------------------------------|--|
|                                                   |                             |    |               | Cured.      |     |     |     | Relieved |     |    |        |                                |  |
|                                                   | M.                          | F. | M.            | F.          | M.  | F.  | M.  | F.       | M.  | F. | Males. | Fem.                           |  |
|                                                   |                             |    |               |             |     |     |     |          |     |    |        |                                |  |
| January,                                          | 6                           | 2  | 9 0           | 7 1         | 1 0 | 1 0 | 1 0 | 0 0      | 0 0 | 6  | 1      |                                |  |
| February,                                         | 6                           | 1  | 8 0           | 4 0         | 3 0 | 1 0 | 1 0 | 1 0      | 5   | 1  |        |                                |  |
| March,                                            | 5                           | 1  | 6 3           | 4 0         | 1 0 | 0 1 | 0 0 | 6        | 2   |    |        |                                |  |
| April,                                            | 6                           | 2  | 13 2          | 8 1         | 2 0 | 1 1 | 0 0 | 8        | 2   |    |        |                                |  |
| May,                                              | 8                           | 2  | 17 2          | 12 2        | 1 1 | 0 0 | 1 0 | 11       | 1   |    |        |                                |  |
| June.                                             | 11                          | 1  | 9 2           | 10 2        | 0 0 | 1 0 | 0 0 | 9        | 1   |    |        |                                |  |



| For 34 years,<br>beginning<br>with 1843.<br>1843. | Rem.<br>from past<br>month. |    | Admit-<br>ted. |    | DISCHARGED. |    |          |    |      |    |                   |    | Remaining<br>to next<br>month. |      |
|---------------------------------------------------|-----------------------------|----|----------------|----|-------------|----|----------|----|------|----|-------------------|----|--------------------------------|------|
|                                                   |                             |    |                |    | Cured.      |    | Relieved |    | Dead |    | Trans-<br>ferred. |    |                                |      |
|                                                   | M.                          | F. | M.             | F. | M.          | F. | M.       | F. | M.   | F. | M.                | F. | Males.                         | Fem. |
| July,                                             | 9                           | 1  | 4              | 1  | 6           | 0  | 3        | 0  | 1    | 1  | 0                 | 0  | 3                              | 1    |
| August,                                           | 3                           | 1  | 9              | 1  | 2           | 0  | 1        | 0  | 1    | 1  | 0                 | 0  | 8                              | 1    |
| September,                                        | 8                           | 1  | 0              | 2  | 4           | 1  | 4        | 0  | 0    | 0  | 0                 | 0  | 0                              | 2    |
| October,                                          | 0                           | 2  | 6              | 1  | 3           | 2  | 0        | 0  | 0    | 0  | 0                 | 0  | 3                              | 1    |
| November,                                         | 3                           | 1  | 4              | 0  | 3           | 1  | 0        | 0  | 1    | 0  | 0                 | 0  | 3                              | 0    |
| December,                                         | 3                           | 0  | 3              | 5  | 5           | 2  | 0        | 0  | 1    | 0  | 0                 | 0  | 0                              | 3    |
| January,                                          | 0                           | 3  | 11             | 5  | 4           | 4  | 0        | 1  | 0    | 1  | 0                 | 1  | 6                              | 2    |
| February,                                         | 6                           | 2  | 15             | 3  | 12          | 1  | 0        | 0  | 0    | 1  | 1                 | 0  | 8                              | 3    |
| March,                                            | 8                           | 3  | awaiting       |    |             |    |          |    |      |    |                   |    |                                |      |
| April,                                            | 6                           | 3  | 5              | 4  | 4           | 2  | 1        | 0  | 2    | 2  | 0                 | 0  | 4                              | 3    |
| May,                                              | 6                           | 1  | 14             | 0  | 9           | 1  | 1        | 0  | 3    | 0  | 0                 | 0  | 7                              | 0    |
| June,                                             | 0                           | 7  | 13             | 1  | 8           | 0  | 1        | 0  | 3    | 0  | 1                 | 0  | 7                              | 1    |
| July,                                             | 7                           | 1  | 3              | 0  | 3           | 0  | 3        | 1  | 0    | 0  | 0                 | 0  | 4                              | 0    |
| August,                                           | 4                           | 0  | 4              | 1  | 4           | 0  | 0        | 0  | 1    | 1  | 0                 | 0  | 3                              | 0    |
| September,                                        | 3                           | 0  | 1              | 1  | 3           | 1  | 1        | 0  | 0    | 0  | 0                 | 0  | 0                              | 0    |
| October,                                          | 0                           | 0  | 2              | 3  | 1           | 1  | 0        | 0  | 1    | 0  | 0                 | 0  | 0                              | 2    |
| November,                                         | 0                           | 2  | 4              | 1  | 0           | 1  | 0        | 0  | 2    | 1  | 0                 | 0  | 2                              | 1    |
| December,                                         | 2                           | 1  | 5              | 3  | 2           | 2  | 1        | 0  | 0    | 0  | 0                 | 0  | 4                              | 2    |
| January,                                          | 4                           | 2  | 4              | 1  | 5           | 3  | 0        | 0  | 0    | 0  | 0                 | 0  | 3                              | 0    |
| February,                                         | 3                           | 0  | 4              | 1  | 2           | 0  | 0        | 0  | 0    | 0  | 0                 | 0  | 5                              | 1    |
| March,                                            | 5                           | 1  | 6              | 0  | 7           | 1  | 0        | 0  | 1    | 0  | 0                 | 0  | 3                              | 0    |
| April,                                            | 3                           | 0  | 6              | 3  | 3           | 1  | 0        | 0  | 0    | 0  | 0                 | 0  | 6                              | 2    |
| May,                                              | 6                           | 2  | 6              | 3  | 7           | 1  | 0        | 1  | 0    | 0  | 0                 | 0  | 5                              | 3    |
| June,                                             | 5                           | 3  | 11             | 3  | 10          | 2  | 0        | 0  | 1    | 1  | 0                 | 0  | 5                              | 3    |
| July,                                             | 5                           | 3  | 6              | 1  | 4           | 3  | 1        | 0  | 2    | 0  | 0                 | 0  | 4                              | 1    |
| August,                                           | 4                           | 1  | 2              | 0  | 4           | 1  | 0        | 0  | 0    | 0  | 0                 | 0  | 2                              | 0    |
| September,                                        | 2                           | 0  | 11             | 0  | 6           | 0  | 0        | 0  | 1    | 0  | 0                 | 0  | 6                              | 0    |
| October,                                          | 6                           | 0  | 5              | 3  | 6           | 0  | 0        | 0  | 1    | 1  | 0                 | 0  | 4                              | 2    |
| November,                                         | 4                           | 2  | 10             | 1  | 5           | 2  | 1        | 0  | 3    | 1  | 0                 | 0  | 5                              | 0    |
| December,                                         | 5                           | 0  | 6              | 0  | 6           | 0  | 0        | 0  | 0    | 0  | 0                 | 0  | 5                              | 0    |
| January,                                          | 5                           | 0  | 12             | 5  | 5           | 0  | 0        | 0  | 2    | 1  | 2                 | 0  | 8                              | 4    |
| February,                                         | 8                           | 4  | 8              | 2  | 7           | 3  | 0        | 0  | 1    | 1  | 1                 | 0  | 7                              | 2    |
| March,                                            | 7                           | 2  | 7              | 5  | 5           | 4  | 0        | 0  | 2    | 0  | 0                 | 0  | 7                              | 3    |
| April,                                            | 7                           | 3  | 19             | 1  | 14          | 2  | 0        | 0  | 2    | 1  | 0                 | 0  | 10                             | 1    |
| May,                                              | 10                          | 1  | 11             | 7  | 10          | 5  | 0        | 0  | 0    | 1  | 0                 | 0  | 11                             | 2    |
| June,                                             | 11                          | 2  | 8              | 8  | 13          | 7  | 0        | 0  | 0    | 1  | 0                 | 0  | 6                              | 2    |
| 1846.                                             |                             |    |                |    |             |    |          |    |      |    |                   |    |                                |      |
| Sum                                               |                             |    | 307            | 85 | 237         | 60 | 26       | 4  | 36   | 18 | 7                 | 1  |                                |      |

TABLE, No. II.—Pleuritis.

| 1845.<br>Month. | Rem.<br>from past<br>month. |    | Admit-<br>ted. |    | DISCHARGED. |    |       |    |         |     |                   |     | Remaining<br>to next<br>month. |     |
|-----------------|-----------------------------|----|----------------|----|-------------|----|-------|----|---------|-----|-------------------|-----|--------------------------------|-----|
|                 |                             |    |                |    | Cured.      |    | Impd. |    | Unimpd. |     | Trans-<br>ferred. |     | Dead                           |     |
|                 | M.                          | F. | M.             | F. | M.          | F. | M.    | F. | M.      | F.  | M.                | F.  | M.                             | F.  |
| July,           | 5                           | 0  | 1              | 0  | 0           | 0  | 4     | 0  | 0       | ... | ...               | ... | 0                              | ... |
| August,         | 2                           | 0  | 2              | 0  | 1           | 0  | 1     | 0  | 0       | ... | ...               | ... | 1                              | ... |
| September,      | 1                           | 0  | 3              | 0  | 1           | 0  | 0     | 0  | 0       | ... | ...               | ... | 0                              | ... |
| October,        | 3                           | 0  | 1              | 0  | 1           | 0  | 0     | 0  | 1       | ... | ...               | ... | 0                              | ... |
| November,       | 2                           | 0  | 2              | 1  | 0           | 0  | 1     | 0  | 0       | ... | ...               | ... | 1                              | ... |
| December,       | 2                           | 1  | 3              | 0  | 1           | 0  | 0     | 0  | 0       | ... | ...               | ... | 1                              | ... |
| January,        | 3                           | 1  | 2              | 0  | 2           | 0  | 0     | 1  | 0       | ... | ...               | ... | 0                              | ... |
| February,       | 3                           | 0  | 1              | 0  | 0           | 0  | 0     | 0  | 0       | ... | ...               | ... | 1                              | ... |
| March,          | 3                           | 0  | 4              | 0  | 0           | 0  | 2     | 0  | 0       | ... | ...               | ... | 1                              | ... |
| April,          | 4                           | 0  | 2              | 0  | 2           | 0  | 0     | 0  | 0       | ... | ...               | ... | 0                              | ... |
| May,            | 4                           | 0  | 0              | 3  | 4           | 3  | 0     | 0  | 0       | ... | ...               | ... | 0                              | ... |
| June,           | 0                           | 0  | 3              | 0  | 0           | 0  | 0     | 0  | 0       | ... | ...               | ... | 0                              | ... |
| 1846.           |                             |    |                |    |             |    |       |    |         |     |                   |     |                                |     |
| Sum             |                             |    | 24             | 4  | 12          | 3  | 8     | 1  | 1       |     |                   |     | 5                              |     |

TABLE, No. III.—Typhus Abdominalis.

| 1846.     | Rem.<br>from past<br>month. |    | Admit-<br>ted. |    | DISCHARGED. |    |          |    |      |    |                   |     | Remaining<br>to next<br>month. |      |
|-----------|-----------------------------|----|----------------|----|-------------|----|----------|----|------|----|-------------------|-----|--------------------------------|------|
|           |                             |    |                |    | Cured.      |    | Relieved |    | Dead |    | Trans-<br>ferred. |     |                                |      |
|           | M.                          | F. | M.             | F. | M.          | F. | M.       | F. | M.   | F. | M.                | F.  | Males.                         | Fem. |
| January,  | 10                          | 6  | 3              | 9  | 6           | 5  | 0        | 2  | 2    | 3  | 0                 | ... | 5                              | 5    |
| February, | 5                           | 5  | 4              | 6  | 3           | 5  | 0        | 1  | 2    | 0  | 1                 | ... | 3                              | 5    |
| March,    | 3                           | 5  | 6              | 4  | 4           | 7  | 0        | 0  | 2    | 0  | 0                 | ... | 3                              | 2    |
| April,    | 3                           | 2  | 17             | 8  | 6           | 3  | 0        | 0  | 5    | 2  | 0                 | ... | 9                              | 5    |
| May,      | 9                           | 5  | 14             | 5  | 10          | 2  | 1        | 0  | 3    | 4  | 0                 | ... | 9                              | 4    |
| June,     | 9                           | 4  | 16             | 5  | 9           | 0  | 0        | 0  | 6    | 2  | 0                 | ... | 10                             | 7    |
| July,     | 10                          | 7  | 19             | 2  | 16          | 4  | 0        | 0  | 3    | 1  | 1                 | ... | 9                              | 4    |
| Sum       |                             |    | 79             | 39 | 54          | 26 | 1        | 3  | 23   | 12 | 2                 |     |                                |      |

ART. VIII.—On the use of the Nitrate of Silver in the cure of Erysipelas. By JOHN HIGGINBOTTOM, F. R. C. S. E., Nottingham. (Read before the Provincial Medical and Surgical Association, at the Anniversary Meeting at Derby, Wednesday, August 4th, 1847.)

I HAVE found that if the nitrate of silver be applied *early*, it subdues local inflammation and irritation, if we employ, at the same time, the most efficient means for regulating the digestive organs.

At an early period of my practice, in slight cases of erysipelas, I used constitutional remedies alone, hoping that the inflammation would have been arrested; but having been so often disappointed, I now use both local and constitutional remedies simultaneously, and especially the nitrate of silver. Even in mild cases of erysipelas, in which I did not apply the nitrate of silver, I found the disease very long in duration, and I observed that the patients had sometimes numerous small abscesses requiring the use of the lancet, which might have been prevented altogether by the early application of the nitrate of silver.

The objections I formerly entertained to the very early application of the nitrate of silver, were the pain and inconvenience attending the discoloration of the part on which it is applied, which remains for a week or more; but these objections are trifling compared with the continued severity of the disease, if permitted to run its usual course, particularly on the head, in which there is also great danger of inflammation of the membranes of the brain and of serous effusion. I have found that when the inflammation has been subdued by an early use of the nitrate of silver,

the constitutional symptoms were immediately relieved; the constitutional disturbance is directly aggravated by the least increase of local inflammation, and in a few hours, after a decided application of the nitrate of silver, the inflammation is arrested and gradually subdued, and with it the constitutional symptoms cease.

Even in idiopathic erysipelas, there is no period of the disease when I would not apply the nitrate of silver. I have never in any cases seen metastasis, or any other bad effect from the use of this important remedy.

When it is necessary to apply the nitrate of silver over an extensive surface as in erysipelas, I have for some years used the concentrated solution in the manner proposed by Mr John Gooch, Surgeon, R. N., in a paper published in the *Lancet* of September 15th 1832, entitled "Practical remarks on Erysipelas, as it appeared on board His Majesty's ship, *Prince Regent*." The strength of the solution is not given in this paper; I prescribe it in the following manner:—

℞ *Argenti Nitratis*, ʒ iv.; *Acidi Nitrici*, gtt. vj.; *Aqua Distillata*, 3 iv.

In erysipelas of the face when it is spreading on the forehead, or at all on the scalp, the head should be shaved as early as possible, in order that we may trace the extent of the inflammation on the scalp, which often can only be detected by pain, or by an œdema being felt on pressure with the finger. The affected part should be well washed with soap and water to remove any oily substance from the skin, and afterwards with pure water, to wash away any particle of soap remaining. The concentrated solution may be then applied several times on the inflamed part, and for two or three inches beyond the inflamed margin on the healthy skin. It requires to be applied very freely all over the scalp, where it scarcely or never produces vesication.

In about twelve hours it will be seen if the solution has been well applied. If any inflamed spot be unaffected by it, the solution must be immediately re-applied to that. Sometimes even after the most decided application of the nitrate of silver the inflammation may spread; but it is then generally much less severe, and it is eventually checked by the repeated application of this remedy. I have in some cases of traumatic erysipelas found the inflammation to spread more severely and more rapidly than in the idiopathic, but by the free repeated application of the nitrate of silver, it has at length been subdued.

The following cases are selected to illustrate this mode of treatment:—

Case I.—On the 6th of August 1844, I visited Miss A., 20 years of age, of very delicate constitution, and of a strumous diathesis. She had been exposed to rain, and had neglected to

change her damp clothing. She experienced the common symptoms attending cold, accompanied by a slight erysipelatous inflammation of the right side of the cheek and nose. The constitutional symptoms were so slight, and the pulse so little accelerated, that I wished to avoid the application of the nitrate of silver, thinking the inflammation might be subdued by other remedies. I directed thirty grains of ipecacuanha as an emetic, and in three hours after its operation two pills, containing three grains of calomel, and eight grains of the compound extract of colocynth, followed by a purgative of salts and senna, repeated every three hours until it operated freely.

7th. Early the following morning, although the emetic and purgative had operated satisfactorily, she was labouring under a severe attack of fever; the pulse was 140, and the erysipelas had spread considerably on the face and forehead, and slightly on the scalp. I opened a vein in the arm, and took away blood in the semi-recumbent position to the amount of twelve ounces, when she became faint. Her head being shaved, the concentrated solution of the nitrate of silver was applied upon and beyond the whole of the inflamed surface, and also around the ears, to prevent them becoming inflamed. I applied it very freely over one-half of the scalp, thinking this might be sufficient, as only a small portion of the forehead was affected. I prescribed two grains of the calomel, with two of antimonial powder, every six hours.

There appeared no increase of the inflammation on the 8th, and the pulse 120; the bowels had been well moved.

9th. She had a restless feverish night, attended with slight delirium, the pulse being 120. There was no increase of erysipelas on the face, but it was spreading on the remaining part of the scalp. I applied the solution of the nitrate of silver over the remaining part of the scalp. Neither of the ears were in the least affected. The solution of the nitrate of silver had apparently formed a barrier, over which the erysipelas did not spread.

On the 10th the patient was in every respect improving.

From this time Miss A. recovered without interruption.

Case II.—I visited Miss B., aged 30 years, on the evening of the 18th of December 1843. She had been indisposed several weeks. There were considerable fever, a quick pulse, and pain of the head, and she had a patch of erysipelas on the upper part of the nose, and a little across the lower part of the forehead. I prescribed an emetic of ipecacuanha, followed by a dose of calomel and compound extract of colocynth, and the sulphate of magnesia in infusion of senna.

On the morning of the 19th, the erysipelas had spread all over the face, and as high as the forehead, close to the scalp, and there was no abatement of the constitutional symptoms. I bled her

whilst sitting up in bed until she fainted, and directed the head to be shaved, and I then applied the solution of the nitrate of silver all over the face, and one-half of the scalp. In the evening I applied the solution of the nitrate of silver over the remaining part of the scalp; having found that one ear had become inflamed, I applied the solution both upon it and around the other ear affected.

20th. The fever was considerably abated; the pulse was 100. From this day the patient was convalescent.

Case III.—I visited Miss C., aged 20 years, on the 14th of September 1844.

She had a sense of coldness and pain of the limbs the day before; she had then a slight degree of erysipelas on the left side of the nose, cheek, and upper lip. I directed an emetic and pill, with the compound colocynth powder and calomel, followed by an active dose of infusion of senna and sulphate of magnesia.

In the evening I found the erysipelas increased and spreading towards the ear; the lower eyelid was considerably swollen, but the erysipelas had not reached the forehead; pulse 100; no pain of the head. I applied the strong solution of the nitrate of silver all over the inflamed surface and the surrounding healthy skin for several inches, particularly round the ear. A grain and a half of calomel, with two grains of antimonial powder, was given every six hours, and a saline effervescing medicine every three hours.

16th. The application had been effectual, and there was no increase of the erysipelas; the pulse was 80.

Case IV.—Mr J. S., aged 30 years, had slight febrile symptoms on the 11th of December 1843, which arose from exposure to cold. He had taken aperients and saline medicines. Two days afterwards there was a patch of erysipelatous inflammation on the right side of the face, without any considerable increase of fever. The nitrate of silver was well applied on the inflamed part, and on the surrounding skin. There was no further extension of erysipelas.

It will be observed in the two last cases, when the nitrate of silver was promptly applied, before the erysipelas had produced severe constitutional symptoms, that the progress of the disease was instantly arrested, and that the patients speedily recovered. In the case of Miss B——, although the erysipelas at first was suffered to proceed, the application of the nitrate of silver to the whole scalp prevented any cerebral affection, and the patient was convalescent in a short time. In the first case related, there were restlessness and delirium fifteen hours after the application of the nitrate of silver, but it was observed that the scalp where the nitrate of silver had not been applied was inflamed, and on the decided application of the nitrate of silver on the whole of the scalp,

the delirium ceased. From these cases as well as from my experience of many years, I conclude that the speedy application of the nitrate of silver will arrest the progress of erysipelas, and prevent cerebral mischief. It is also of great practical importance to subdue erysipelatous inflammation in the commencement, for I have observed when the attacks have been severe, that the patients afterwards become more subject to a recurrence of the disease.

The great obstacle to the general and free use of the nitrate of silver, even at the present day, appears to arise from the impression on the minds of many surgeons that it is a caustic—a destructive agent. If they could be divested of that idea, and use it as freely as they would a common blister of cantharides, their fears would soon subside. From repeatedly observing the safety of the application, and also its beneficial effects, in my own practice I have always considered it a safer remedy than cantharides, as it may be applied freely over a surface, even where very active inflammation exists, or where there is an extensive surface denuded of its cuticle. This remedy has also the advantage of not affecting the bladder, or producing strangury.

The nitrate of silver is not a caustic in any sense of the word. It subdues inflammation, and induces resolution and the healing process. It preserves, and does not destroy the part to which it is applied. If we compare a caustic, as the hydrate of potassa, with the nitrate of silver, we find that the hydrate of potassa destroys and induces a slough and the ulcerative process; but if we touch a part with the nitrate of silver, the eschar remains for a time, and then falls off, leaving the subsequent parts healed.

If an ulcerated surface secreting pus be touched by the nitrate of silver, the succeeding discharge is immediately converted into lymph; it is the property of the hydrate of potassa, on the contrary, to induce not only ulceration but suppuration. In short, the peculiar properties of the nitrate of silver have long been kept unknown to us by the designation of lunar caustic, affording the most striking instance of the influence of a term, or of a classification, upon the human mind. The nitrate of silver and the hydrate of potassa, (as indeed all caustics,) are as the poles to each other; the first preserves, the second destroys; the first induces cicatrization, the second ulceration.

*Nottingham, July 27th 1847.*

ART. X.—*On Grinders' Asthma*. By CHARLES FOX FAVELL, M. D., Physician to the Infirmary, Sheffield.\*

THE process of grinding is carried on in distinct buildings, to which the name of *wheels* is given. At some of these establishments, from one hundred to two hundred individuals are employed. The *wheels* are divided into separate apartments, which differ from each other considerably in size, and consequently accommodate different numbers of workmen. The rooms in which the men work are called *hulls*, and each hull contains a number of troughs, (technically called *trows*,) proportionate to its dimensions. The trough is an excavation formed in the floor of the room, in which the stone revolves; and each trough has two or three compartments, commonly called *holes*, in one of which the glazing wheel revolves. The glazing wheels are composed of wood and leather, and vary considerably in size; those on which pen-knives are glazed are generally about fourteen inches in diameter, whilst those employed for table-knives are thirty-six inches in diameter. These wheels, as well as the stones on which the grinding is performed, are attached by broad leather straps, called *wheel-bands*, to a wheel of much larger dimensions, situated at the back part of the room, and known by the technical name of *the drum*. This latter piece of machinery is put in motion by the steam-engine, with which it is connected, and its revolutions cause the wheels and stones which are attached to it to revolve also. The connection which exists between the wheels and the drum may be effected or discontinued in a very brief space of time, in consequence of the facility with which the wheel-bands are put on and off. When the grinder is at work, he sits on a kind of small bench, to which the name of *the horse* is given; his arms are stretched outward and the body bent forward.

The stones used by the grinders differ greatly in their qualities, some being hard and brittle, and others being comparatively soft and yielding. The former are used for what is called *dry* grinding, and the latter for *wet* grinding. Both varieties are met with abundantly in the neighbourhood of Sheffield.

It will be obvious, from the remark just made, that the grinders may be divided into two classes,—the wet and the dry; the former carry on their operations on a perfectly dry stone, whilst the latter work on a stone which is constantly kept moist. A large proportion of the workmen, however, are occasionally engaged in both these branches, in consequence of many of the articles requiring to be ground both on the wet and on the dry stone. This is particularly the case with scissors, razors, and pen-knives; table-knives also, although chiefly ground on a wet stone, have what are called the *bolsters* ground on a dry one.

\* Abstract from Trans. of Provincial Association, Vol. xiv. or 2d of New Series

The dust which arises from the operation of grinding, especially where much of the dry variety is practised, is very considerable in quantity. What influence this has in the pulmonary affection to which allusion has already been made, is shown by the greater prevalence of disease and mortality among the tradesmen who practise dry grinding.

It is not, however, only during the process of grinding that large volumes of dust arise, but also during *racing* and *glazing*. The term *racing* is applied to the process by which the stone is rendered perfectly true. A man stands before it with a bar of steel, and whilst the stone is rapidly revolving, applies the bar in such a manner as to ensure the entire surface of the stone being uniformly smooth and level. *Glazing* is the last process, which is carried on at the wheel, and is the means by which a *polish* is given to the articles which have been ground. The *glaze* employed in giving the polish to different articles, is not always the same. In glazing forks, emery and glue are the only substances employed; for pen-knives, oil and emery are mixed together, and the leather which encircles the wheel is also smeared over with bees-wax. The glaze for table-knives is composed of suet, bees-wax, and emery, with which what is termed the *glazer* is anointed. The same person both grinds and glazes. It is obvious that the quantity of dust arising from the process of glazing must vary according to the composition of the glaze employed. That used in glazing forks will occasion much the largest quantity.

A few particulars respecting the statistics of grinders shall complete these preliminary observations. For most of the facts connected with this branch of my subject, I gladly acknowledge my obligations to the elaborate work of Dr Holland. It has previously been remarked, that Dr Holland's observations were published in the year 1843; the following numbers, therefore, have reference to that period. Some slight alterations in several of the departments, I am aware, have subsequently occurred, but they are not of sufficient extent to invalidate the general accuracy of Dr Holland's tables.

1. *Fork Grinders*.—The persons engaged in this branch work entirely on a dry stone. The number of adults employed is ninety-seven. There are only nineteen of these who are forty years of age or upwards, and only three who are fifty. Ten of the nineteen either began working at the trade late in life, or were for some years absent from it after they had once commenced. The destructive nature of this occupation will further appear by noticing the ages at which the vast majority die. In a period of five years there are twenty deaths recorded, and of these seventeen are under thirty-five years of age. Again, there are sixty-one deaths recorded as having occurred in fifteen years,—from 1825 to 1840,—and of these, forty-four (more than two-thirds) were



under thirty-five years of age, and only one solitary individual attained the age of forty-eight. A comparison of the ages at which an equal number of deaths occur, either in other trades, or more particularly amongst those who are employed in agriculture, would render the injurious tendency of the occupation at present under consideration still more striking.

2. *Scissor Grinders*.—Scissor-grinding is one of the mixed varieties of grinding, being partly effected on a dry stone and partly on a wet one. The process of what is technically called *humping*, for example, or giving the rounded form to the blade of the scissor, is always performed on the dry stone. Those who are engaged in this branch of trade, however, work much more on wet than on dry stones; but we shall find that there are some striking differences in the statistics, as compared with wet grinders, to which it is important to attend. In the class of scissor-grinders there are 213 adults, of whom 161 are under forty years of age. Between the years 1830 and 1843, (thirteen years), 102 individuals engaged in this department of trade died; forty-one of these were under thirty-six years of age, whilst sixty-one died between the ages of thirty-six and sixty-five. The greatest mortality, amounting to more than a fourth of the whole, occurred between the ages of thirty-six and forty. In the fork-grinders, more than two-thirds of the recorded deaths occurred before the age of thirty-five.

3. *Razor Grinders*.—This branch of trade is partly wet and partly dry. The process of what is called *shaping*, or giving the peculiar curve to the blade, is effected on a dry stone. The back and tang, or small end of the razor, are also ground on a dry stone; all the rest is done on a wet one. There are 275 adults employed in razor-grinding, of whom it is stated that 154 are under thirty-one years of age, and only twenty are above the age of forty-five. The number of deaths recorded, from 1822 to 1841 inclusively, amounts to 182; and on examining the ages at which the deaths took place, we find that ninety-nine (more than one-half) occurred between the ages of twenty-one and thirty-six; sixty-two occurred between the ages of thirty-six and forty-five, being a total of 161; and, consequently, only twenty-one of these 182 individuals attained the age of forty-six. This mortality very greatly exceeds the average mortality of artisans employed in Sheffield.

4. *Pen-knife Grinders*.—Pen-knives are ground on both wet and dry stones, and the mortality amongst the workmen is considerable. The number of adults employed in this branch of trade amounts to 319, of whom 264 are under forty-one years of age. There are 167 deaths recorded as having occurred between the years 1832 and 1843, and of these, forty-one (nearly two-thirds) were under thirty-six years of age.

5. *Tableknife Grinders*.—Table-knives are almost entirely ground on a wet stone. This branch of trade is very extensively pursued in the country, but there are 282 adults employed in it in the town. Between the years 1835 and 1843, fifty-two deaths are recorded amongst the table-knife grinders employed in the town; fifteen of these occurred between the ages of twenty-one and thirty-six. The average duration of life, therefore, is much greater amongst the persons engaged in this branch of trade than in those employed in the departments previously mentioned.

6. *File Grinders*.—The grinding of files is done entirely on a wet stone. There are 150 adults employed in it. The number of deaths recorded in thirteen years only amounts to twenty-four, but of these eighteen were under forty-one years of age.

7. *Saw Grinders*.—Persons engaged in this department use only the wet stone. There are ninety-six adults employed in saw-grinding, of whom a very large proportion are upwards of forty years of age. There are only forty-two deaths recorded as having occurred between the years 1821 and 1843; and of these only six were under thirty-six years of age, whilst twenty were upwards of fifty years old.

8. *Scythe Grinders*.—It appears that there are thirty persons employed in grinding scythes, and they use only the wet stone. There are twenty deaths recorded as having occurred within fifteen years; of this number only three were under forty-one years of age, whilst twelve were between forty-six and sixty.

1. *Habits*.—The moral status of the grinders, as a body, is unhappily very low; and Dr Holland is doubtless correct, when he remarks that "the more desperate the branch, the more ignorant, reckless, and dissipated are the workmen." Many of them, indeed, adopt as their maxim *a merry life and a short one*, and most fearfully does their general conduct accord with the destructive principle they have adopted. Sensual gratification is the great object they have in view, and they are regardless of the cost at which it can be obtained. The moral sense is not blunted merely, but obliterated; the decencies of society are violated; and the laws of God despised. Drunkenness is a very prevalent vice amongst them; and in many instances the grinder will spend nearly his whole time at the public-house for days together, and during that period will scarcely ever be sober. I need scarcely remark, that the necessary consequence of such habits is, that the general health is destroyed, and therefore the system is rendered unable effectually to resist the injurious tendency of those other morbid influences to which the grinder is almost daily exposed.

2. *The exposure to which he is subjected*.—The grinder often works without coat or waistcoat, and always with the chest freely exposed. In this state he frequently leaves his work-room, and

goes into the external air; this he does during the severest days of an inclement winter. Again, a large portion of this class of workmen, as has been already observed, are *wet grinders*, i. e. they use a wet stone, and are, consequently, themselves exposed to the influence of dampness and moisture. The chilling effect which is thus produced on the cutaneous surface, must obviously be prejudicial; the balance of the circulation must be destroyed; and hence we find that the grinder becomes subject to a great variety of diseases: rheumatism, pleurisy, pneumonia, affections of the heart, and inflammatory affections of the abdominal viscera, are amongst the most frequent.

3. *The position in which he works.*—When the grinder is at work, he sits on what is technically called his *horse*, astride a low fixed bench, immediately behind the stone, with his body bent forward over the stone on which he is working, his face, in many departments, being removed but a few inches from it. The degree of inclination varies, however, in different branches of the trade; hence we are informed that “the smaller the article, the more inclined is the body over the stone; and the more elaborate the workmanship bestowed upon it, the less frequently is this position relieved.”\*

Now, it is obvious that the posture which has been described is unfavourable to the free action of the chest; and it is equally obvious, that just in proportion as the motions of the chest are restrained, the circulation through the lungs will be impeded, and pulmonary congestion will result. And what will be the effect of long continued or repeated congestion of the pulmonary vessels? Doubtless there will be a loss of tonic contractility, and the consequent escape of some portion of the contents of the vessels into the pulmonary tissue, constituting, according to individual idiosyncrasies, euplastic, cacoplastic, or aplastic deposits. It is notorious that many chronic diseases of a formidable nature first become apparent, when the powers of the system are unusually debilitated; hence the frequency with which phthisis follows influenza, sometimes after very considerable intervals; and hence, also, the frequency with which scrofula in different parts succeeds any means by which the tone of the system has been impoverished. In these cases, doubtless the first change is effected upon the chemical constitution of the blood, and the tonicity of the vessels becomes impaired afterwards; the vessels permit deposits to take place, and then a series of organic changes, varying in different cases, occur. In connection with the remarks just made, it is important to bear in mind the general habits of the grinders.

4. *The atmosphere which he breathes.*—The process of dry grinding necessarily deteriorates the atmosphere of the room in which the workmen are employed, inasmuch as it occasions the

\* Diseases of the Lungs from Mechanical Causes, p. 84.

evolution of large quantities of dust, consisting of minute particles of stone and metal. In wet grinding the quantity of dust occasioned is much less, and consists almost entirely of metallic particles. The two varieties of grinding, however, are frequently carried on in the same room.

The deteriorated condition of the atmosphere has, perhaps, been regarded too exclusively as the cause of the great mortality of the grinders, whilst too little attention has been paid to the three circumstances previously noticed. There is reason to believe, however, that although the vitiated state of the atmosphere is not to be regarded as the sole cause of the pulmonary affection to which the grinder so often falls a victim, it is, nevertheless, a very important link in the chain of causes. The following brief considerations will establish this:—

(a.) *The breathing of an atmosphere impregnated with dust is capable of producing pulmonary diseases.*—In illustration of the truth of this proposition, I may mention that *maltsters* are very liable to affections of the lungs. Chronic bronchitis and phthisis are very common affections amongst persons thus employed. The atmosphere which the workmen breathe is often impregnated with large quantities of dust. *Leather-dressers* also suffer from similar affections. Thus Dr Hastings, in his treatise on *Inflammation of the Mucous Membrane of the Lungs*, remarks, "Chronic bronchitis is sometimes the result of irritating substances acting on the mucous membrane. Besides the contamination of the air by gaseous substances," he observes, "it is occasionally loaded with impurities, which may act mechanically on the delicate texture of the mucous membrane. The effect of these is generally a disease of a chronic nature." "In this town," he subsequently remarks, "the preparers of yellow leather, and those employed in some parts of the china manufactory, are often subject to severe attacks; they are exposed during some part of the process," he proceeds to observe, "to inhale an air loaded with dust, which produces inflammation of the bronchial membrane of a chronic nature. Dyspnoea is generally the primary symptom, which is often neglected for many months. If the occupation, under these circumstances, be continued, the disease is aggravated; the patient is not unfrequently seized with hæmoptysis, which is occasionally very profuse, and which is accompanied with a great increase of dyspnoea and severe cough." Dr Hastings afterwards gives an account of the *post-mortem* appearances which were observed in three of his cases.\*

\* In the first case, "no tubercles were found in the lungs, but their substance was rather more solid than usual. The mucous membrane lining the bronchia was much inflamed and thickened, and several extensive superficial ulcers were found upon it. The bronchia were filled with a purulent fluid, mixed with blood." In the second case, "the lungs were strongly adherent over their whole surface to the pleura costalis. The mucous membrane of the trachea and bronchia was highly inflamed and ulcerated. The air-cells were filled with mucus, mixed

It is notorious, also, that flax-dressers who likewise often breathe an atmosphere impregnated with foreign ingredients, suffer greatly from pulmonary complaints. And, once more, stone-masons and persons engaged in the dressing of stone, are peculiarly liable to similar affections. I have recently had several of this class of workmen, suffering from organic disease of the lungs, under my own care.

*First*, Grinding was not originally a distinct branch of business; those who were engaged in it had a large portion of their time occupied by other employments, and therefore they were not exposed for so long a period to the noxious influences which are connected with this branch of trade.

*Secondly*, Until the year 1786, the process of grinding was entirely carried on in the adjacent country, at distances varying from two to four or five miles from the town; the rooms also in which the men worked were more lofty, better ventilated, and contained a much smaller number of stones.

*Thirdly*, All grinding wheels were formerly built on the banks of rivers, and water was the power employed to put the machinery in motion. When this was the case, the hours of labour were necessarily limited by the supply of water, which was sometimes very scanty; and during long seasons of drought, which occasionally occurred, a complete cessation from grinding was inevitable.

So long as this state of things continued, grinders' asthma was unknown. But, after a while, a mighty revolution was effected in the condition of the grinder. The genius of commerce shook her wand over him, and fearful was the change which she induced. The grinder was no longer employed in other occupations, such as forging and hafting, but devoted solely to his own department. The wheels ceased to be erected on the banks of the streams which flow along our beautiful valleys; or to consist of a single room, in which only few persons were engaged, and admirably ventilated, if not by the elaborate work of science, at least by the dictates of common sense. On the contrary, large buildings were erected in the lowest part of the town; the different floors were thronged by numerous workmen engaged in various departments of the same trade, and the ventilation of each room was miserably imperfect. And once more, the grinder was, unhappily, rendered independent of the supply of water. The agency of steam was substituted, and thus he was deprived of those periods of recreation which were so intimately connected with the preservation of his health. In consequence of these changes, the grinder was necessarily exposed for a much longer period to the influence of a vitiated atmosphere, as well as to some of those other evils which have previously been considered.

with pus. The substance of the lungs was much gorged with blood; no tubercles or vomica were discovered." In the third case, "many tubercles were found in the substance of the lungs, some of which had suppurated. The bronchial membrane was thickened and ulcerated, and bore marks of having been long inflamed."

—*Treatise on Inflammation of the Mucous Membrane of the Lungs*, pp. 336-342.

The abnormal appearances furnished by the cases may be conveniently classified as follows :

1. Tubercles.
2. Small bodies resembling currants, disseminated extensively on the surface and throughout the substance of the lungs.
3. Large masses found in different portions of the pulmonary tissue.
4. Emphysema.
5. Dilatation of the bronchial tubes.\*
6. Inflammation of the lining membrane of the bronchi, trachea, and larynx.
7. Adhesion of the pleuræ.
8. Enlargement of the bronchial glands.
9. Enlargement of the heart.
10. A granular condition of the kidneys.

On a few of these the following explanations are requisite.

*Dilatation of the Bronchial Tubes.*—In four of the cases the bronchial tubes were found more or less dilated. Authors describe three varieties of dilatation of the bronchi. In the first variety, "the bronchial tubes, instead of becoming progressively and rapidly smaller as they subdivide, present such dimensions, that the subdivisions nearly or quite equal in size the tubes from which they are given off." In the second variety, partial dilatation takes place in one or more tubes, so that a given tube, instead of not diminishing in size, absolutely increases, and sometimes to a considerable extent. The third variety is that in which the bronchial tubes are irregularly dilated and contracted, or, as suggested by Dr Hodgkin, the dilatation being irregular, those portions of a tube or tubes which remain in a normal state appear to be contracted. The kind of dilatation observed in the bodies of grinders was of the first variety.

*Currant-like Bodies.*—Another of the morbid appearances is described as small dark-coloured bodies, resembling currants : these are often extensively met with both on the surface and in the substance of the lungs. A frequent examination of these bodies has convinced me that they consist of nothing more than the dilated extremities of veins, containing some of the solid constituents of the blood. I have often met with precisely the same appearances in other cases where there was much congestion of the pulmonary vessels, and have traced their connexion with the scalpel.

*Masses.*—The only morbid appearance which remains to be accounted for, is the masses which are met with in different portions of the lungs, and which vary considerably in size, colour, and consistence. Sometimes they are not bigger than a nut, at other times they are as large as an orange ; sometimes they are of a greyish colour, at other times they are black ; sometimes they are extremely dense, at others they are cut with ease.

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## PART II.

### CRITICAL ANALYSIS.

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**ART. I.—1.** *Observations on the Healthy and Diseased Properties of the Blood.* By WILLIAM STEVENS, M. D. London, 1832. 8vo, pp. 504.

**2.** *Observations on the Theory of Respiration.* By WILLIAM STEVENS, M. D., D. C. L. Fellow of the Royal College of Physicians in Copenhagen, F. R. C. S., London, &c. Philosophical Transactions for 1835, Part I. p. 345.

THE influence of the collateral sciences, and especially of chemistry and physics, on the theory and practice of medicine has, at all times, been very considerable; and while medicine has doubtless suffered from the rude and imperfect state in which these sciences were in former days, it has also derived great and signal benefit from their more perfect state in modern times. Chemistry, especially by the new lights which have been thrown on the chemical phenomena of living animal and vegetable bodies, has rendered the greatest services both to physiology and pathology; and promises to be the great channel by which we are to look for the elucidation of many mysteries, and the introduction of many further improvements.

It is nevertheless a peculiar character in the advantages supposed to result from the applications of chemical science, that there may be a tendency to expect from them too much, and to carry these expectations much further and to a greater degree of nicety and minuteness, than nature and experience actually warrant. It is of the utmost importance, in all applications of physical laws, to the explanation of the phenomena presented by living bodies, to exercise correct judgment in their proper application, and to take care not to expect from them more than they are really able to accomplish. In several respects, this extreme may be less likely to take place in the present day, from the less absolute and exclusive influence which theoretical and speculative views of all kinds will permanently exert. New and imposing hypotheses or speculations always possess a certain degree of fascination, and invariably attract a certain number of followers. But the number of these tends to

prevent any one from long holding the exclusive possession of the medical mind ; and that which is new to-day or this year, may be modified, at least, if not entirely supplanted by another more plausible, before it has had sufficient time to be thoroughly established. On the other hand, the strong disposition to empirical inquiry, and to furnish the results of experiment and observation, which has been the character of medicine for the last half century at least, must always tend to resist and counteract the exclusive and absolute influence of any set of speculative opinions, and render it impossible for medical doctrine and practice ever to fall completely under the sway of any single theory.

It is for these reasons that we need never again dread seeing medicine under the dominion of a chemical theory, a set of mathematical principles, or a system of zoodynamism ; and while every rational cultivator of the science must admit, that the judicious and useful course is to select from each what is most suitable, he will also see the propriety of investigating the phenomena and action of living bodies, with the aids of chemical and physical knowledge, but not to the exclusion of other properties with which his investigations may make him acquainted.

It seems impossible to doubt, that the great reason why the chemical theory of medicine, which was so much elaborated by De le Boe, Willis, Mercklin, Vieussens, Verheyen, and other ingenious men, fell into discredit before the eclectic system of Boerhaave, was the imperfect and rudimental state of chemical knowledge in the seventeenth century. While physicians were speculating most boldly on the states of the blood, the bile, the pancreatic fluid, and the urine, in health and in many diseases, they had not yet learned the true chemical constitution of these different substances. Every thing, therefore, was supposition and conjecture ; and the patrons of the humoral pathology, the half-offspring at least of the chemical theory, had to contend against the inadequacy and inherent imperfection of the instrument as well as its improper application.

The mathematical theory of physiology, pathology, and therapeutic actions enjoyed a sort of cotemporaneous reign with the chemical, and it partly survived the downfall of the latter. Of these two the humoral pathology may be regarded as the legitimate offspring, partaking of the chemical character of the one and the mechanical actions, motions, and oscillations ascribed to the other ; and in the skilful hands of Boerhaave, the humoral pathology assuredly seemed to rest on a very solid foundation. This stability, however, was only apparent. Inquiry cannot proceed without convincing men, almost in spite of themselves, certainly without their being aware of it, of the errors and evils of what is false and imaginary, and the beauty and advantage of what is true.

England possessed towards the close of the seventeenth century



a set of men probably unequalled since that time in talent for original inquiry, and in the love and capacity for the investigation of nature. Among these the first was Thomas Willis, a man who, though a great commentator on the chemical theory, was the person whose researches and reasonings tended more than those of any other person to overthrow it, and substitute in its stead views quite different. Had Willis not been an indefatigable and industrious anatomist, he must have become known as an ingenious speculator in psychology. His *Anatomy of the Nervous System*, vitiated as it is by the fanciful theory of animal spirits, and his metaphysical speculations in his *Treatise de Anima Brutorum* tended powerfully to introduce and render familiar new views in pathology, while his *Treatise on Medicines* did the same as to therapeutics.

Along with Willis must be mentioned, as inquirers whose labours equally contributed to the same result, Wharton, Glisson, Lower, Mayow, Ridley, Thruston, and Charleton, all of whose writings proved how faithfully they studied nature, how diligently they sought after knowledge, and how ingeniously and happily, amidst mists of error and fallacy, they distinguished the truth. The labours of these men alone, accompanied and followed as they were by those of Morton, Sydenham, Friend, and Mead, tended powerfully and directly to subvert the chemical theory and the humoral pathology.

It must probably be also allowed, that the discredit which had thus overtaken these doctrines, prevented physicians from recognizing in them what was really of value. It was certainly the close of the eighteenth century before physiologists and physicians thought it worth while to look to the chemical actions in the animal body; and it was not till Priestley, Lavoisier, and Fourcroy had shown how much might in this way be accomplished, and how much might be expected from the judicious application of correct chemical knowledge, that it was thought necessary to study the chemical phenomena of animal and vegetable bodies, and to inquire into the laws by which these are regulated. Since that time, it is well known, much has been done to elucidate the chemical phenomena of respiration and digestion, and to understand the morbid phenomena induced by the latter in secretion, and in the production of various morbid states. The blood also has come in for its share of investigation; and not only have many inquirers studied the chemical characters of this liquid and the changes incident to it, but many pathologists expect to find in it the pathological causes of several diseases hitherto supposed to depend on causes altogether different. Thus Dr Todd regards not only gout but rheumatism as connected with, probably dependent on morbid states of the blood; and several other writers agree in

regarding the blood as the seat of disease in scrofula, consumption, cancer, and other maladies.

To the present author belongs the merit of being one of the earliest inquirers into this subject. Dr Stevens appears to have formed various pretty distinct notions on the state of the blood in endemic fever as early as the year 1827, probably previous to this time. But at this time he was led to attach to his views so much importance as to change the mode of practice he had previously pursued. We shall presently direct attention to the peculiarities of these views.

In the thirty-fifth and thirty-eighth volumes of this Journal, some notice was taken of the doctrines promulgated by Dr Stevens regarding the constitution of the blood in health and in certain diseases. The first notice was in reference to an essay or memoir read before the College of Physicians on the 3d of May 1830, previous to the publication of the present volume; and we then took occasion to suggest the propriety of an early publication of his entire facts and views by Dr Stevens.\* The second notice related to the treatment of epidemic cholera as it appeared in the Cold Bath Fields Prison in 1832, by what is called the saline method.† This account formed the concluding part of the present volume, which was not at that time further referred to, and has not hitherto been brought under the notice of our readers in the manner in which the work deserves.

The exposition of his views is given in the present volume, not as we are given to understand, to the whole extent to which it was his intention originally to have unfolded them, but in such a degree as may serve to illustrate those peculiar opinions which the author has been led from experience and reflection to entertain.

The present work consists of three divisions. The first is devoted to the exposition and illustration of those general principles in the chemical and physical properties of the blood, in relation to animal heat and respiration, which Dr Stevens thinks he is enabled to establish from various facts and experiments. The second part consists of observations on fever, more particularly on remittent, ague, and yellow fever. And the third part contains the memoir read before the College of Physicians in 1830, with various documents regarding an epidemic of yellow fever at Trinidad in 1828, and observations on cholera as it appeared in the Cold Bath Fields Prison, London, in 1832.

In the first part, Dr Stevens examines at some detail the nature and cause of the red colour of the blood. After describing the process of coagulation, and the mode in which the serum is separated from the clot, which is very accurately done, Dr Stevens controverts directly the opinion, that the red colour of arterial

\* Edin. Med. and Surg. Journal. Vol. xxv. p. 221, &c. Edin. 1831.

† Ibid. Vol. xxxviii. p. 455. Edin. 1832.

blood is produced by the absorption of oxygen. Scarlet, he contends, is the natural colour of the blood in its normal state. This colour is blackened by the presence of carbonic acid, and all that the oxygen does in contributing to the formation of the red colour is by combining with carbonic acid, for which, he maintains, it has a powerful attraction, and by thus removing the carbonic acid, the red colour is restored to the venous blood, exactly in proportion as this liquid parts with carbonic acid. Oxygen, he further argues, cannot of itself produce either the red appearance or the arterial constitution; for when the clot at first formation is covered with a layer of distilled water, or any other fluid which does not contain saline matter, the acid may be removed by the oxygen or absorbed by the water, but the colour becomes darker than it was before. On the other hand, if the black and saltless clot is immersed in any clear saline fluid, the colour instantly changes from a dark venous to a bright arterial, and when the fluid employed is sufficiently impregnated with saline matter, this change is produced when we make the experiment Dr Stevens adds, as he has frequently done, even in an atmosphere of carbonic acid.

“When the crassamentum remains covered with its own serum it retains for a time its arterial colour; but when we add an extra portion of saline matter to the natural serum, the surface of the clot instantly becomes much brighter than it had been before, that is, so long as it was merely covered with its own serum, which was less impregnated with saline ingredients; or, when we cover the crassamentum, the moment it coagulates with a clear but strong saline fluid, the colour instantly changes from purple to scarlet.

“If we cut out a part of the red clot when it first coagulates, it is then, as I have said, all equally red. When we immerse this red clot in distilled water, it becomes black; or if we place this portion of red coagulum on a table, the serum escapes from the sides and lower part of the clot; while that part of the upper surface of the crassamentum which is left in immediate contact with the air, or even with pure oxygen, becomes black exactly in proportion as the serum falls down from the surface and escapes from the clot. Now, from this simple fact, it is very clear that it is not the oxygen of the air, but the serum, or some of the ingredients in this fluid, which are the cause of the red hue of the colouring matter, and, consequently, of the red colour of the blood.” Pp. 10—11.

Dr Stevens does not allow that the red colour of the blood depends on the presence of iron either in the form of peroxide or in that of sulpho-cyanate; because, he argues, whatever the colouring matter may be, even when it is quite black, it possesses the property of striking a red colour with any of the neutral salts, which does not take place with iron or any of its oxides; and because, as to the latter, though the sulpho-cyanic acid strikes a red colour with the peroxide of iron, yet sulpho-cyanic acid does not

redden the blacker colouring matter, but, like other acids, blackens even the reddest blood.

Which of the ingredients in the serum is the cause of this red colour ? for in the serum Dr Stevens infers this red-giving principle must reside. From all the phenomena presented by the dark-coloured and red states of the blood, Dr Stevens infers that it is to the saline matter in the serum that the formation of this red colour must be ascribed.

Muriate of soda or chloride of sodium, Dr Stevens next reminds his readers, is the principal saline ingredient in the blood ; and the general use of this as a condiment in all civilized countries, he thinks, shows, as it were, its instinctive necessity ; while the fact, that every article of nourishment contains either salt or the basis of saline matter which must enter the circulating current, shows how abundantly and instinctively the article is supplied. He appeals also to the experiments of Dr Prout, to show that animals possess the power of generating certain salts independent of the supply which they receive with their food.

Saline matter, in short, is an invariable ingredient in all healthy blood. The colouring matter of the blood does not appear to be necessary to the performance of its operations ; for it is often very deficient ; and the fibrin and albumen may likewise be deficient ; yet the functions may be performed. But without the saline matter, the blood appears to be rendered quite unfit for the varied functions which it performs in different organs and regions of the body. Further, in certain morbid conditions of the system, as in the last stage of yellow fever, endemic fever, cholera, and similar diseases, the blood becomes black exactly in proportion to the diminution of its saline matter ; and when the latter is diminished to a certain extent, the blood becomes so vapid as to be totally incapable of stimulating the heart. The condition which it then presents is what used to be termed by the humoral pathologists dissolution. Such blood when exposed to the air does not become red ; but when a small portion of saline matter is added to this black and lifeless fluid, the scarlet arterial colour is immediately restored, and after this it is not only florid, but less offensive than the same blood, to which any saline ingredient has not been added.

“ When we cut out a piece of the red crassamentum from healthy blood which has just coagulated, and immerse this in distilled water, the water rapidly attracts the saline ingredients out of the clot. In proportion as this takes place the colour changes, and in a short period it becomes perfectly black : from this we may infer, that black is the natural colour of the colouring matter ; for it is only red so long as it remains in immediate contact with a saline fluid. When we take this black clot out of the distilled water, and expose it directly to the air, it remains black ; or, if we immerse it in a jar of

pure oxygen, the oxygen can now no more redden its colour, than it can change the colour of the blackest ink. There is but one way by which the red colour can be restored, and that is neither by air, iron, nor oxygen, but by restoring to the blood the saline matter which it has lost; and when we sprinkle or rub a small quantity of the muriate or the carbonate of soda, or any of the neutral salts, on the black clot, not merely the red, but a colour that is highly arterial, is immediately produced; or when we make an artificial serum, by impregnating water with any of the neutral salts, and then take the black clot out of the clear fresh water and immerse it in this equally clear saline fluid, it is immediately changed from black to a bright red colour. When we take this scarlet clot out of the saline fluid, and immerse it again in distilled water, it soon becomes black; but when we remove it from this, and immerse it again in the clear saline fluid, it again changes to a rich scarlet; and this we can repeat, even with the same clot, as often as we please. Now, as these experiments prove that, when the saline matter is withdrawn from the blood, it becomes black, and when this is restored it recovers its arterial colour, we may then, I believe, safely infer that the saline matter of the vital current is the true cause of the red colour of the colouring matter, and, of course, of the red colour of the blood."—Pp. 16, 17.

The author allows, however, that there is one exception to the rule already stated of acids blackening the blood. As the carbonates are weaker salts than those formed with fixed acids, for instance the muriates or hydrochlorates, and as the alkaline carbonates form a considerable proportion of the natural saline matter of the blood, it follows, that when an acid solution just strong enough to convert this weaker into a stronger salt is employed, the colour is then brightened. Hence a salt with a slight excess of acid increases the intensity of the arterial appearance, and when any of the acids are first mixed with warm blood, the red colour is augmented. But if a very small proportion more of a fixed acid than is merely sufficient to convert the alkaline portion of the carbonates into neutral salts be added, the colour is so irrecoverably destroyed by the excess of acid, that, with the addition of a little water, the whole is converted into a fluid which exactly resembles black vomit.

The author then answers an objection which may readily be urged against this part of his hypothesis. If the saline impregnation be the cause of the red colour of the blood, why has the arterial blood a bright scarlet colour, and the blood in the veins a dark or modena red, while the latter contains as much saline matter as the former. First, answers Dr Stevens, it is not the fact that venous blood contains as much saline matter as arterial; for, with one exception, viz. the bile, all the secretions derive their saline ingredients from the arterial blood; and the venous

blood which returns from the different secreting organs, must contain all that less saline matter, which is eliminated in the secretions. All the difference, however, he allows, is insufficient to account for the great difference in colour; and therefore he contends we must look for another cause.

This other cause is the existence of carbonic acid in the venous blood, while there is none in the arterial.

Dr Stevens is very decided in maintaining the doctrine, that the presence of carbonic acid, and not carbon, is the cause of the dark colour of venous blood; and as connected with this, that carbonic acid is attracted by oxygen in the lungs, and not that the carbonic acid is formed by union of the oxygen and carbon.

That carbonic acid exists in the blood he infers from the following facts:—1st, The experiments of Edwards, which showed that even when animals were made to breathe hydrogen gas, the blood gave out carbonic acid gas; and 2d, from various experiments which he instituted on purpose, and which left little doubt that carbonic acid existed in the blood.

Upon this point, it is well known, great discordance of opinion prevails among physiologists; one party maintaining that they have obtained carbonic acid from the blood, and the other party denying that this acid can be obtained from blood. As exhaustion by the air-pump has been the means most generally employed to obtain carbonic from venous blood, Dr Stevens first inquires whether this method is not liable to fallacy; and he finds, in performing this experiment under circumstances calculated to determine the point accurately, that the air-pump does not separate carbonic acid from blood.

1. Dr Stevens placed in a glass vessel, under the receiver of an air-pump, a small quantity of warm fluid venous blood. In proportion as the air was exhausted, globules appeared to escape from the blood, at first small, but as the air was removed, they became larger. 2. A small quantity of venous blood under the receiver of an air-pump was covered with a layer of barytic water. When the air-pump was used, globules were observed to escape from the blood, and pass through the barytic water, without impairing the transparency of the latter. 3. He then received a quantity of venous blood into a phial, in such a manner that air was entirely excluded, while a communicating glass vessel containing hydrogen was the only recipient; and he found, that under the receiver of the air-pump, there was no indication of the escape of carbonic acid gas.

“ From the first of these experiments it might be inferred that a gas is capable of being removed from venous blood by the air-pump; but this supposition may possibly be erroneous; for similar globules appear to arise when we use water, even after it has been boiled and

then cooled in a close vessel to 98°. The second experiment shows that this appearance is not due to the escape of carbonic acid; and from the third experiment, it is very obvious that carbonic acid cannot be so obtained from venous blood, which has not been exposed to air.

" 5. Carbonic acid was introduced into an empty bladder that had been previously well moistened with warm water. When the bladder was distended about one-third, its neck was firmly tied with a waxed thread, by which it was suspended in the centre of a receiver of an air-pump. When the pump was worked, the bladder increased in volume, and in a few seconds was much distended. Nearly the whole of the atmospheric air was exhausted from the receiver, but the bladder, though apparently very tense, did not burst, neither did it decrease in size. A shallow glass vessel containing barytic water had been placed under the same receiver, but the transparency of this was not affected. Hydrogen was then transmitted into the receiver, and the bladder was reduced to the same size as when first suspended under it; but, after an interval of four hours, it had become perfectly flaccid. In fact, there was scarcely a particle of carbonic acid left in it, and the barytic water within the receiver contained a quantity of carbonate of baryta.

" 6. A double-necked bottle was carefully filled with pure hydrogen, and about five ounces of blood were drawn into it from a vein in the arm, in the same manner as in experiment 3. Both the orifices of the bottle were then closed, and the blood and the hydrogen well agitated together. After this the lower orifice was immersed in distilled water, and the bottle left undisturbed for nearly an hour, to allow the hydrogen to act on the blood. The orifice of the descending tube was then immersed in barytic water, the lower valve was opened, and the whole apparatus put under the receiver of the air-pump. When the pump was used, the gas which was over the blood passed through the barytic water, and immediately rendered it turbid. This experiment seems to prove that venous blood does contain carbonic acid; and as the only difference between experiments 3 and 6 was, that in the former the pump was used *immediately*, and before the hydrogen had time to act on the blood, whilst in the latter the hydrogen was allowed to act nearly an hour, it would appear that the hydrogen has some power of removing the carbonic acid, and that this removal may even take place through a membrane. In the last experiment, the blood which was used had been carefully excluded from atmospheric air, and the hydrogen was pure; consequently the carbonic acid could have been derived from no other source than the venous blood itself.

" 9. A small quantity of blood was drawn into the double-necked bottle containing atmospheric air, as in the last experiment. Both of the valves were closed, and *after agitation, the bottle was allowed to stand about an hour during which the colour of the blood changed from venous to arterial*. The lower orifice was then immersed in barytic water, the apparatus was put under the receiver of the air-pump, and when the pump was used, the gas which escaped *gave a*

*milky appearance to the barytic water.* In the eighth experiment the pump was used immediately, and before the air had time to act on the blood, or the blood on the air. In the last, one hour was allowed for the action of these agents upon each other; during which the blood on the surface changed from venous to arterial, and the air over the blood received the addition of carbonic acid.

"From the preceding statement we may, I think, conclude,

"1st, That venous blood contains carbonic acid;

"2nd, That the mere effect of diminished pressure upon the surface of the blood is not necessarily followed by the escape of its carbonic acid."—Phil. Trans. pp. 346—349.

It appears here, therefore, that Dr Stevens establishes, or at least endeavours to establish, two inferences; the first, that carbonic acid is contained in the blood, and may be obtained from it; the second, that there is a peculiar attraction in oxygen for carbonic acid, and conversely, in carbonic acid for oxygen, by means of which oxygen attracts powerfully and irresistibly this latter substance whenever it meets it.

"10. A piece of moist bladder was tied firmly over the mouth of a tumbler containing oxygen pure gas. This was introduced into a large bell glass filled with carbonic acid. In a short period the membrane which had been tied over the glass became convex, and so tense that it appeared to be on the point of bursting. On examining the air contained in the tumbler, it was found that the oxygen had drawn in a large quantity of the carbonic acid; but no oxygen appeared to have passed out of the tumbler.

"11. A piece of moist bladder was tied over the mouth of a tumbler containing carbonic acid; this was introduced into a bell glass filled with pure oxygen. In a short period the membrane became concave, and the oxygen in the larger vessel was found to be mixed with carbonic acid.

"13. A piece of the intestine of a rabbit that had been recently killed was filled with *carbonic acid*, and suspended in a bell glass containing *oxygen*. In a short period the acid escaped, and the intestine became quite flaccid.

"14. A piece of intestine, similar to that used in the last experiment, was filled with *oxygen*, and suspended in a bell glass of *carbonic acid*; the intestine began to swell almost immediately, and in three minutes it burst.

"15. The *lung* of a rabbit was filled with oxygen, and suspended in a bell glass of carbonic acid; it began to swell almost instantly, and in one minute it burst.

"16. The *lung* of a rabbit was carefully inflated with carbonic acid, and was then suspended in a bell glass of oxygen. In a very short period it became flaccid, and the external oxygen was impregnated with carbonic acid.

"These experiments show how admirably the structure of the lungs is adapted for the action of oxygen on carbonic acid. Vitality may have some share in accelerating this process in the pulmonary



organs, but we know that by the agency of oxygen dead blood may be changed from venous to arterial, even through a dead membrane."—Phil. Trans. pp. 346—351.

We may afterwards recur to this alleged power of oxygen in attracting carbonic acid. But to complete the views to which Dr Stevens is led, we shall finish with certain applications to the physiology of the circulation and respiration.

We have seen that the venous blood is distinguished from arterial, according to Dr Stevens, by containing carbonic acid, not carbonaceous matter, as has generally been taught. Where does it obtain this carbonic acid? Solely, answers Dr Stevens, in the course of the circulation. The blood in the smallest and most remote arterial branch is as pure arterial blood as in the left ventricle and aorta; and the blood in the smallest venous *radicula* or twig is as completely darkened and venousized as in the *vena cava* or right auricle. The blood, therefore, acquires its venous properties in the intermediate set of vessels, the capillaries, which are in truth the seat of all the great processes at all times going on in the animal body; nutrition, secretion of every kind, absorption, and deposition.

"There is in the capillary system, over the whole body, an intermediate structure which connects the arterial with the venous circulation, and it is in this structure that the blood is changed from arterial to venous. When the arterial blood leaves the minute arteries, it is no longer confined in actual vessels, but in cells that are formed by the surrounding tissue. When this cellular structure is examined in living animals, with the assistance of a good microscope, minute globules are seen to leave the cells and penetrate the surrounding solids, whilst other globules are seen to return and mix with the blood in the cells. Now as we know that it is in these cells that the blood becomes dark and venous, from the addition of carbonic acid, may we not suppose that the globules which leave the blood are minute particles of oxygen, attracted perhaps from the arterial blood by the fixed carbon of the solids, and that the globules which return are minute particles of carbonic acid? This cannot be easily proved; but as carbon is a principal ingredient in the solids when these are converted into fluids, previous to their removal by the lymphatics, it appears to me not improbable that a part of their carbon may be liberated, perhaps for the purpose of evolving heat. We have seen that the blood which receives oxygen in the lungs passes unchanged through the arteries into the capillary system: and it is apparently there that animal heat is evolved. When carbonic acid, which is the result of the above process, is added to the venous blood, it not only blackens the colour, but renders it incapable of supporting life. For this reason warm-blooded animals have a double circulation, one for circulating the arterial, and another for purifying the venous blood.\*

\* It is well known that cold-blooded animals use very little food. If a rattle-

"When we obtain *hæmotosine*, or the colouring matter of the blood, in a pure state, it is black ; but a solution of any neutral salt possesses the peculiar property of striking a beautiful scarlet or arterial colour with it. When we make an incision into a clot of blood which has just coagulated, we find that the clot is then all equally red ; when we cut out a thin slice of this red clot, and immerse it in distilled water, the salt serum oozes into the water. In proportion as this takes place the clot becomes darker ; and when the whole of the serum is removed, perfectly black. When in this state neither atmospheric air, nor even pure oxygen, is capable of changing its colour ; but when we immerse this black clot in a clear saline solution it instantly changes from jet black to a scarlet or arterial colour. From these facts we may conclude, that oxygen is a secondary agent in the change of colour from venous to arterial ; and that if the scarlet colour of the blood be essential to life, it is produced, not by oxygen, but by another cause. The mere removal of the carbonic acid from venous blood would not produce any change of colour, were it not that there is in the blood itself another agent which produces the arterial tint, the moment that the blackening effect of the carbonic acid is removed ; this is effected by the action of the natural saline ingredients of the blood on the colouring matter. When oxygen is added to blood it may have a slight share in brightening the colour, but it can only perfectly effect this when the colouring matter is in contact with a saline fluid. Oxygen is so far from being the sole cause of the arterial colour, that even pure oxygen is *of itself* inert as a colouring agent ; whilst a saline fluid changes the colour of the blood from venous to arterial even in an atmosphere of carbonic acid.

" Many authors describe the changes which occur in respiration, by asserting ' that oxygen disappears and carbonic acid is emitted.' But from some of the experiments which I have detailed, it is evident that the removal of the acid is the first part of the process, and the addition of oxygen the last. Others have maintained that when two gases act upon each other, the one penetrates the membrane at the same moment that the other is removed. But if this were the case, why did the membrane become *convex* in experiment 10, and *concave* in experiment 11 ? If the action were equal, the membrane would remain unchanged ; but this is so far from being the case, that in some experiments the membranes become distended to such an extent that they actually burst."—Phil. Trans. pp. 352, 353.

snake gets one good meal in three months, it is all that he requires ; but even this is not actually necessary ; for I have seen one of these animals that had not tasted food or water for twelve months, as plump, active, and venomous as those in the wild state. On the other hand, all those animals that have warm blood require an immense quantity of food, and if they do not receive this they soon perish ; but nineteen-twentieths of this appears to be taken into the system for the evolution of animal heat. The carbon is ultimately derived from the nourishment that we use, and the oxygen is directly derived from the arterial blood ; a constant supply of nourishment is therefore necessary in warm blooded animals, but a very small part of the blood which is formed from this is required for nutrition, and if the whole of it were expended in this way, it is very clear that there would be none left to return by the veins.

In short, the doctrine maintained by Dr Stevens is, that there is between oxygen and carbonic acid a peculiar attracting power; that the blood is converted from arterial into venous in the capillary system or in the extreme vessels, as they were wont to be named; that this conversion consists in the loss of oxygen and the addition or formation of carbonic acid; and that when the venous blood is returned to the lungs, the oxygen of the air admitted into these organs is forcibly and irresistibly united with the carbonic acid, and thus removes that substance from the blood, which is in this manner prepared once more to perform its round of the system.

There seems to be no error or fallacy in the experiments of Dr Stevens; and his inferences appear to be justly formed from these experiments. Perhaps it may to some appear to be of little moment in the theory of respiration, whether we say that the venous blood contains carbon or carbonic acid; perhaps it may be that carbonic acid is the only form in which carbon can exist in the blood. It must still be allowed to be an important distinction that the withdrawal of this material is accomplished by the peculiar attractive power of oxygen, and that the constant and periodical withdrawal of this substance forms the leading character of the arterial blood.

We have formerly shown, that the views of Dr Stevens as to the influence of saline matter on the blood are confirmed by the experiments of Dr Edward Turner.\*

Connected with this part of the subject is what Dr Stevens terms the latent power of attraction, or that property by which gaseous bodies, especially, act on each other forcibly, whenever placed in the required conditions and circumstances. Probably it was unnecessary to call this power latent any more than any other property; for it is latent only because its effects do not appear unless under the required conditions of approximation and proper quantity; and in the same sense almost all the great properties of material bodies may be said to be latent. On this point, however, we dwell not. By latent power of attraction, Dr Stevens understands that property in oxygen by which, though comparatively little, it elevates carbonic acid, though a body much heavier, and unites with it generally. Dr Stevens argues, and was the first to maintain, that this power is so irresistible, that it operates readily through a thin membrane, as for instance a bladder, or the mucous membrane of the lungs. It appears, indeed, that Dr Stevens was the first to prove that gaseous bodies may, like liquids, act on each other through their membranes, and present all the phenomena of *endosmosis* and *exosmosis*. It appears, also, that his services to science in this respect and the priority of his claims have not yet received that general degree of acknowledgement, to which they are evidently entitled.

\* Edin. Med. and Surg. Journal, vol. xxxix. p. 249.

In the thirty-sixth volume of this Journal, p. 211, 1831, was given an account of experiments by Mr Graham, now of the London University College, Dr Faust of Columbia, and Dr Mitchill of Philadelphia, showing that certain gases, as carbonic acid gas, azote, hydrogen, and oxygen, are capable of passing through a thin membrane, as a bladder, and acting on each other. These experiments by Dr Faust and Dr Mitchill were published in the American Journal of Medical Sciences for November 1830. It appears from very distinct, and, so far as can be judged, trustworthy statements contained in the volume before us, that the whole of this was first taught by Dr Stevens, and that the transmissibility of gases through membranes, and the action at least of oxygen on carbonic acid in this way, and the converse, was communicated by Dr Stevens to various gentlemen who must have been in communication with Dr Mitchill. The following passage contains the most important of the observations of Dr Stevens.

“ A carbonic atmosphere can only exist where there is some local cause for the rapid evolution of that gas ; and even then it is only met with in those places where the acid is evolved much faster than it can be removed by the oxygen of the air. In cold countries, for example, where the attraction goes on more slowly, the carbonic acid generally occupies a considerable space immediately over the liquor in the fermenting vats : but, in the West Indies, the acid is removed so rapidly by the air, that candles burn with a bright flame even down to the very surface of the fermenting fluid. I have often ascertained this fact in the butts that are used for fermenting the cane-liquor before it is distilled into rum ; for even when the liquor was two feet below the upper edge of the air-tight butts, and when the fermentation was at its height, still, during the heat of the day, the acid was so rapidly removed, that animals could live in that space, and a candle would burn immediately above the fluid as well and as bright as it had done in the open air.

“ During my last residence in the United States, I visited the Saratoga springs, near the Hudson river, where I remained about five weeks ; and whilst there, as I had both time and an excellent opportunity, I not only repeated some of my former experiments, but made a number of others, with the natural carbonic acid of the High Rock. The greater part of these experiments may, perhaps, be published hereafter. In the mean time, I may state that they completely confirmed the results of my former investigations, and strengthened the conclusions which I had drawn from them.

“ The High Rock is near to the village of Saratoga, and stands by itself in a low valley, which appears at that place as if it had been at some former period the bed of a considerable river. In this valley a stream of fresh water runs on the surface ; but underneath this there exists another current of water, which is rich in saline matter, similar in quality to that which is found in the serum of the blood. This water also contains a larger proportion of free carbonic acid than, per-

haps, any other natural saline water that has yet been discovered. A current of this fluid rises at some height in the cavity of the High Rock; the solid circular wall of which has evidently been formed from the solid ingredients in the saline water. The rock rises in the air in the shape of a large cone. Its lowest circle is said to be about nine feet in diameter; but this part has sunk about four feet under the surface of the surrounding earth, while the diameter of the rock, which is so large at the bottom, becomes gradually less in proportion as it ascends in the air, about five feet higher than the level of the neighbouring ground.

"This rock is hollow in the centre, the internal cavity is large at the bottom, but gradually becomes less in size in proportion as it rises in the air, leaving the circular solid wall of the cavity nearly of an equal thickness from the bottom to the top, where the air within the rock communicates with the external atmosphere, by means of a circular aperture that opens upwards with a diameter of not more than twelve inches.

"It is very evident that, at some former period, the water in this cavity must have risen to the top, escaped by the hole in the upper circle of the cone, and descended by its sides. But, probably, in proportion as the aperture became too small to admit of the escape of the whole body of the water, a part of the fluid has forced its way underneath by some new channel. From this, or some other cause, the fluid, at present, escapes beneath, almost as fast as it enters; for the water does not now rise more than six feet in the rock; that is, about two feet above the level of the surface of the earth; so that the surface of the fluid in the cavity is about three feet from the upper aperture.

"The stream in the rock is constantly renewed; and as this saline fluid is supersaturated with carbonic acid, the constant escape of this gas produces an incessant simmering on the surface, and, frequently, is forced through the water in such quantities, and with such force, as to give to the whole body of the liquid the appearance of a strong ebullition.

"As the circular wall is perfectly air-tight all round, this constant supply of carbonic acid, which is forced up incessantly from the water, can only make its escape from the hollow cavity of the rock by the aperture in the upper part of the cone. Now as carbonic acid is so much heavier than atmospheric air, we would naturally conclude, that the whole of that space in the cavity, which extends from the surface of the water to the upper opening in the cone, would be occupied with carbonic acid. This, however, is not the case, for when I put down a burning candle, at different periods, into the cavity, I found that the carbonic atmosphere seldom rose higher than from one foot to one and a half above the surface of the water, while the candle burned perfectly bright in the air, in that part of the cone which extends from the orifice to the carbonic atmosphere; that is, from about one foot, to eighteen inches, beneath the circular opening.

"As the solid walls of the cone are perfectly air-tight, it is very evident from the above circumstance, that either the air, or some

power which the air possesses, lifts up the heavier carbonic acid out of the cavity almost as fast as it escapes from the water. This power is in constant operation, but it acts with most force when the temperature is high, as it was in August and September, when these observations were made. I found, however, even at that season, the carbonic atmosphere rose much higher at night than during the day; and one night, when the weather was cold for that season of the year, the carbonic atmosphere had risen to within six inches of the upper orifice.

"The degree of motion in the external air has also a considerable influence over the quantity of acid which accumulates in the rock. When the external atmosphere is in free circulation, and, of course, a constant supply of oxygen over the opening, the removal of the acid goes on much faster than it does when the air is still. One forenoon, when there was a breeze in the valley, I found only three inches of carbonic atmosphere over the water; on another occasion, when the air was almost still, I found that it had risen two feet and a half. But whatever it may do in winter, it never, in summer, rises entirely to the opening.

"This circumstance of the rising and falling of the carbonic atmosphere in the cavity of the rock, accounts for a fact, which had been long known to the boys who are in the habit of showing experiments with the gas to strangers who generally visit that place, either to drink the water or from curiosity. When rabbits, or other small animals, are put into the aperture, and let down into the cavity about the length of the arm, they are generally killed in about three minutes; but, at other times, they can remain there for half an hour with the most perfect impunity; or, as one of the boys stated the case, 'sometimes the animals would die fast enough; but, at other times, they were so obstinate, that they would not die merely to please the people.'

"To ascertain whether it was or was not the oxygen, or some power in this gas which removed and prevented the rising of the carbonic acid to the upper aperture, I had a large funnel made on purpose by a tin-smith in the village of Saratoga. This was constructed of such a size, that the large end of it exactly covered the aperture at the top. This funnel was applied to the orifice, and the part which rested on the rock was made perfectly air-tight all round with a cement of moist clay. When this was perfectly adjusted, I applied my finger to the small aperture of the funnel, to prevent any communication with the external air, and raised it for a moment, from time to time, in order to allow the common air, already in the cavity, to be forced up by the pressure from beneath. When I felt convinced that the whole of the atmospheric air had been forced out, I then fixed a moist empty bladder on the small end of the funnel; this filled slowly, evidently from the rapidity with which the carbonic gas was removed by the external air through the coats of the moist bladder. In about twenty minutes, however, it was nearly full. It was then taken off, and a small quantity of the gas contained in the bladder was passed through lime-water; and from the quantity of

carbonate of lime that was suddenly formed, it was very evident that the air in the bladder was pure carbonic acid, and that this, as soon as it had ceased to be removed by the oxygen of the external air, had ascended in the cavity of the rock, not merely to the aperture, but that it had then been forced up by the pressure from beneath through the funnel into the bladder.

"The following experiments, made with the natural carbonic acid, prove that membranes, much denser than that which separates the air from the blood in the lungs, will not prevent the oxygen from acting on the carbonic acid, and lifting it up through the medium of dense membranes.

A piece of moist bladder was tied firmly over a tumbler of carbonic acid, and when this was exposed to the air, a part of the acid was evidently removed by the oxygen, faster than the air could enter, for the volume of the acid in the tumbler was soon diminished, and the membrane became concave from the atmospheric pressure. But when I reversed this experiment, and tied a piece of white leather (such as apothecaries use for blisters) over a tumbler of common air, and then immersed it in the carbonic atmosphere of the High Rock, there was soon such an increase of volume in the air contained in the tumbler, that the membrane swelled up, and became so very tense, that I was obliged to remove it from the carbonic atmosphere almost immediately, for fear that the glass might burst in my hand.

"In the first experiment, the decrease of volume in the air contained in the tumbler was not produced by any decrease of temperature; neither did the increase of volume in the second arise from any increase of heat; and to ascertain whether the oxygen, or something else in the air contained in the tumbler, had, or had not, drawn into itself, and that too with force, a part of the carbonic acid, even through the dense membrane, this when it became tense, was immediately punctured with the point of a lancet, and a part of the air was drawn up from the bottom of the glass by an ear-syringe, with a long pipe. This air was passed through lime-water, which I had ready for the purpose; and a small portion of the contained gas instantly whitened the whole of the water. From this it was evident that oxygen, or something else in the atmospheric air, possesses the power of attracting carbonic acid to itself, even through a membrane much denser than that in the lungs, which separates the air from the blood, or the blood from the air.

"In the above experiments, the oxygen was evidently the agent which acted on the acid, for nitrogen possesses no power of attracting carbonic acid; neither was it the carbonic acid of the air which attracted the acid from the tumbler; for one gas does not attract another of the same kind, consequently, carbonic acid can have no power in attracting itself."—Pp. 82—90.

In applying the facts thus brought forward to the theory of respiration, Dr Stevens met with some opposition. When in Paris in October 1829, he had some conversation with Dr Edwards on the subject; but that gentleman was decided in refusing

to give any credence to the idea that carbonic acid could be attracted by oxygen. He stated that he had adopted Spallanzani's opinion, and had proved by experiments, that the acid was merely exhaled through the pulmonary membrane. It is well known, that the experiment by which this inference was supported was that of making animals breathe in atmospheres of hydrogen gas ;—when it was found that carbonic acid was present in the exhaled air. Dr Stevens found, on reconsidering this point, that hydrogen gas possesses, as well as oxygen, the power of lifting up carbonic acid, though in a smaller degree ; and especially in a confined atmosphere, such as that in which the animals were made to breathe. The hydrogen gas had indeed, in the experiments of Dr Edwards, attracted the carbonic acid through the pulmonic membrane, exactly as oxygen does, though less forcibly.

Our limits do not allow us to enter into all the details brought forward by Dr Stevens in order to substantiate his claim to priority in the views now mentioned. Our readers will find them given in the present volume. It is sufficient to say, that we think he completely establishes his point, that these views were familiar to his mind previous to 1829 and 1830.

Both the American authors ascribe the phenomena of conjunction or mutual union of gases, under the circumstances now specified, to what they call penetrativeness, and endosmose and exosmose in the fluids. But it seems doubtful whether it is preferable to admit this property of penetrativeness, or the commonly received one of attraction, as taught by Dr Stevens. If, indeed, all the phenomena be considered carefully, most persons will be convinced that the phenomena resemble those resulting from attraction more than from any other agent.

In another circumstance also, the American authors agree with each other and differ from Dr Stevens. Both regard carbon, not carbonic acid, as the matter existing in the blood. In this point, Dr Stevens appears decidedly to have the best side of the question. He proves the fact that carbonic acid exists in venous blood ; and no one has yet proved that carbon exists in it as an independent and separate element.

Dr Stevens applies the doctrines now established to the explanation of the production of animal heat, which consistently enough, he maintains, is evolved, not in the lungs, but all over the capillary system. In short, the arterial blood does not, according to his views, part with its heat, latent and combined, until the blood reaches the capillary system ; where, in the processes of nutrition and secretion, it is naturally employed in maintaining the temperature of the whole body. This doctrine cannot be regarded as quite new ; for it has been more or less distinctly taught by many physiologists. To Dr Stevens, nevertheless, belongs the merit of



illustrating and enforcing it with several new proofs. Carbonic acid, he observes, is manifestly formed in the extreme vessels. Whenever this substance is formed, heat is developed and eliminated; and as carbonic acid is eliminated in the capillary system only, it follows that heat must be eliminated in these vessels only also. The carbon, which forms so considerable a portion both of the fluids and solids of the animal body, is in a state of constant change or changeability. It is in the process of incessant union with the oxygen of the textures, attracting the oxygen from the arterial blood when the latter arrives in the capillary vessels, and in this way the carbonic acid is formed and heat is eliminated (pp. 36 and 38.)

This is in truth the *cremation* of Liebig; and it is proper to say that the doctrine was published by Dr Stevens before it was announced by the professor of Giessen.

Dr Stevens further maintains, that this heat-giving property in the blood of the capillary vessels depends greatly on the proportion of saline matter which it contains. He explains also a fact which has long been admitted. It is well known that the lower animals cannot exist long without salt in their food. In severe winters in North America and other cold regions, the farmers cannot keep their sheep alive without giving them salt in considerable quantity with their food. It is also well known that in marshy districts the sheep and cattle, if not regularly and seasonably supplied with salt, become sickly, feeble, diseased, and perish in great numbers.

Dr Stevens is next an advocate for the vitality of the blood. That this principle belongs to the blood he infers from two circumstances; the first, that the blood has the property of evolving heat and maintaining the temperature of the system; and the second, that the blood, so long as it is alive and in the body, resists all chemical changes; whereas, the moment that chemical changes not subordinate to, and regulated by, vital properties, begin to take place, the vitality of the blood is gone. While the blood circulates in the vessels, both the fibrin and the albumen owe their fluidity to the circumstance of their being held in solution by a saline fluid, the serum; and, so long as the vital current is in active circulation, its vitality prevents the occurrence of those changes which are the cause of its coagulation when removed from the system. But when part of the blood is drawn from the body, it dies, and becomes solid, or rather, is separated into solid and liquid parts, because the vital power is no longer acting.

Yet even in this change the lingering traces of life may be recognized. The blood of health is not dead at the moment at which it is drawn. It only becomes solid when its vitality is so far diminished as to render it incapable of resisting the effects of

certain changes which take place when the removed blood is allowed to rest; yet even when coagulation begins, the fibrin of healthy blood retains so much vitality, as to enable it to contract and form a firm fibrous clot, which is very different from the soft jelly-like clot which is formed when dead blood is taken out of the heart and exposed to the air.

Blood may be deprived of its vitality either by poisons, extreme cold, electricity, or by other causes, yet the fibrin of this lifeless blood becomes to a certain extent solid when exposed to the air; but half firm clot thus formed is very different from the clot furnished by healthy blood drawn from a person of any vigour. In certain states of the system, on the other hand, where unusual debility has been induced, the blood, though it coagulates, begins to undergo chemical changes much sooner than in the state of health.

Now this fibrous portion of the blood evinces contractile power under the use of muriate of soda. When salt is mixed with the blood before the fibrin begins to coagulate, it is prevented from assuming the solid form, by being dissolved in a fluid that is so much more abundant in saline matter than common serum. When, however, fibrin is allowed to assume the solid form before adding salt, it acquires new properties, and is no longer soluble even in a saline fluid. If, again, at a certain period after coagulation has commenced, we add salt, or a saline solution to the coagulating blood, the moment that the fibrin feels the stimulus of the salt, the whole becomes suddenly solid; and Dr Stevens has seen the fibrin of inflammatory blood, which had been drawn during the hot stage of marsh fever, contract, on the application of salt, with almost as much rapidity as the muscles, when the same stimulus is applied to the fibres of the living body. This phenomenon he regards as a strong proof of the vitality of the blood; for the fibrin of lifeless blood will no more contract on the application of stimuli than the muscular fibres of an animal that has been many days dead. In short, Dr Stevens concludes, that, if the blood without the body possess the power of resisting to a certain extent, the effects of extreme heat, cold, noxious agents, and chemical changes, which must be injurious to life, and if the fibrin of living blood possess sensibility to such a degree (we would call this irritability,) as to feel and react on the application of stimuli, it is reasonable to believe that the blood possesses life within itself, which exists totally independent either of the brain, or spinal marrow, or nervous system.

“When a warm-blooded animal is bled to death, the heart almost immediately ceases to contract, from the want of its natural stimulus to keep up its action; but when we cut off the head of another animal of the same class, secure the vessels in the neck,

and keep up an artificial respiration, so as to purify the blood, the heart retains its vitality, and continues to act with force, even for many hours. The blood continues to circulate, and the solids not only retain their vitality, but the muscles continue to act with great power, even for a long period after the head of the animal has been fairly separated from the body. That such is the fact is evident from what occurred in the celebrated experiments of Mr Brodie. We have seen, also, that when the structure of the brain is completely destroyed, and the chest of a rabbit is opened immediately, so as to expose the blood in the large vessels, &c. to the action of the air, the auricle continues to live, to feel, and to react on the blood, for three hours, even after the brain has been converted to a perfect pulp. Now, from this alone we may infer, that the solids are not indebted to the brain for their living principle; for if the nerves, either of themselves, or from their connection with the brain, be the cause of animal vitality, why is it that the solids instantly die when deprived of their blood; and that, too, even when the brain and the nerves are left uninjured? On the other hand, that the solids derive their life from the blood is evident from the fact that the heart, and the other vascular organs, as well as the muscles, &c. &c., continue to act so long as they are supplied with pure blood, and retain their vitality for many hours after the brain of the animal has been reduced to a perfect pulp, or even after the head is removed from the body;—consequently we may infer, that the blood in its healthy state possesses life, and that the solids themselves can only live and retain their vitality so long as they are supplied with their living fluid, and when this is withdrawn, death must immediately follow in the heart, the brain, in the nerves, and the whole body, ‘for the life of the flesh is in the blood,’ and without this they instantly become mere inanimate matter.”—Pp. 133—134.

The part of his work hitherto examined may be regarded as that containing the physiological or theoretical principles of his doctrines. He enters next on the application of these to explain the mode in which different agents, beneficial or deleterious, act on the human body. In this he adheres to the principles already unfolded, and undertakes to show that the great proportion of powerful agents, and among others many poisons, act not on the brain and nervous system, but on the blood. Dr Stevens does not by this mean to say that certain agents do not act on the brain and nervous system. All that he contends for is, that the number of those which so act has been greatly over-rated, and that a considerable number act through the medium of the blood. Many remedies, in like manner, he argues, operate through the medium of the blood. We think that it is impossible to doubt that many agents, both poisonous and remedial, act through the medium of this fluid. At the same time, as the blood touches and visits every point of the nervous system, it is equally impos-

sible, we conceive, to deny that the brain and nerves are secondarily affected. This also Dr Stevens seems to admit as part of his theory, (p. 137.)

The following details illustrate this point so well that we give them in the words of Dr Stevens.

“ There are certain noxious agents that are almost inert, so long as they are merely applied to the sentient extremities of the nerves. The poison of the rattle-snake, for instance, is perfectly harmless when applied to the eye, the tongue, &c. : it may even be taken into the stomach with the most perfect impunity. I have given it internally, in large doses, to foxes, monkeys, dogs, and other animals ; but still it produced no apparent effect. Yet, when a small quantity of the same fluid is inserted into a recent wound, or injected into a vein, it causes death in a few minutes.

“ The rattlesnake has two fangs, which are concealed in a sheath, one on each side of the upper jaw ; they are curved in their shape, and their point is as sharp as that of a common needle. They are hollow in the centre, and the root of the fangs are connected with the poison-bags. These reptiles generally use only one fang at a time, and when they do use it, they seize the part with their mouth which they intend to poison, they then perforate it deeply with the fang. At this moment the bag contracts, and the deleterious fluid which has such an enmity to the blood is injected into the very bottom of the wound, through a small aperture in the under part of the fang, at a short distance from the sharp point. Having effected his purpose, he withdraws the instrument, and then leaves his victim to his fate.

“ When a small animal, a rabbit, for example, is poisoned by this snake, it does not seem to feel pain at the moment ; and, generally, for the first five minutes, he appears to be perfectly well. At the end of this period, however, the ears begin to droop, he seems giddy and uneasy, the lower extremities soon lose their power, he falls on the ground : the pupils dilate, slight convulsions come on, and the animal dies, generally in about fifteen minutes from the time that the poison had been injected into the wound.

“ When we examine the part immediately after death, we find that the poison has completely destroyed the red colour of the blood, and not only of this, but for two inches all round the puncture, the muscular fibres, and even the cellular substance are as black as if they had been for hours in a state of complete mortification. The blood in the veins which lead from the wound is also black, and even that which is taken from the heart is darker in colour, and does not coagulate so firmly as in those animals that are killed by a blow on the head. When we examine the head, after death, there is a want of blood in the brain, similar to that which occurs in those persons who die during the cold stage of fever ; but neither the brain nor any of the solids appear to have sustained the slightest injury, except at the wound, and this, of itself, is not sufficient to account for the suddenness of the death. But the blood is diseas-

ed even in appearance ; and my belief is, that this poison, like most of the others, produces death, not by any direct impression on the brain, but by suddenly depriving the blood of its vital principle ; for the solids cannot continue to live when that dies which is, in truth, the cause of their vitality.

“ The exact time that this poison requires to produce its effect depends, in a great measure, on the quantity of blood contained in the part to which it is applied. When injected into fat or other substances, where there is little blood circulating in their texture, the poison appears to be almost inert. It is, probably, for this reason, that hogs attack even the most venomous snakes with perfect impunity, and eat them, poison and all, without suffering in the least. On the other hand, when a full-grown rabbit is bitten in a fleshy part by a large rattlesnake, death generally follows in from twelve to fifteen minutes ; but, in one instance, where the animal died in three minutes and a-half, on examining the part, I found that the fang had pierced a vein of considerable size.

“ Fatal as this poison is when it mixes with the blood, yet when we cut out the black flesh from the poisoned wound, and give it to a dog, or any other carnivorous animal, he eats it readily, and takes it into his stomach with the most perfect impunity. Or, if we saturate a piece of bread with the poison, he eats it, without suffering in the slightest degree. Nor is it any chemical mixture betwixt the blood and the poison which causes death ; for I have mixed the fluid with recent blood, and dogs eat it readily without being poisoned. It is, therefore, only fatal, when it mixes with the living blood, in a living animal, and causes death, as I believe, by destroying the vitality, first of the blood, and then of the whole body ; for this fluid does not act as a poison when applied to the sentient extremities of the nerves, and the mere organic injury which is done to the solids is not of itself sufficient to account for the sudden death.

“ There are more noxious agents than one that may be perfectly innocent in one part of the system, but deadly in their effects when applied to another. A certain quantity of carbonic acid, for example, may be taken into the stomach with the most perfect impunity, yet the same agent causes almost instant death when taken into the lungs. Blood containing carbonic acid produces no evil effects on the internal surface of the right side of the heart, yet the same acid acts as a poison when the blood that contains it passes into the left ventricle, or the coronary arteries, without being purified in the pulmonary organs. The juice of the Wourali vine, like the venom of the rattlesnake, is not a poison when merely applied to a nervous surface, yet it causes almost instant death when it mixes directly with the living blood. We all know that the poison of the viper can be swallowed with impunity ; we have seen also that the same is the fact with respect to the venom of the rattlesnake ; for these agents act only as *poisonous* when they mix with the *blood* : yet though they are not poisonous even in large doses, still it is probable that they are not altogether inert when they are taken into the stomach ; for there, they are probably changed in their properties by the

gastric juice before they enter the circulation, either by the veins, or as part of the chyle. Mr Wallace, of Virginia, took the whole of the poison from the two fangs of a large and vigorous rattlesnake. This he made into pills, 'bags, venom, and all.' These he swallowed himself, sometimes at the rate of four a day. They produced, he says, most heavenly sensations, and 'melancholy was quickly changed into gay anticipations ;' but unfortunately, these delightful feelings were followed by a general dropsy, which continued for a considerable period. However, he is still very sanguine about the virtues of this venom, when used internally, and thinks the time is not very distant when rattlesnakes will be reared for medicinal purposes, as much so as either the poppy or palmachristi.

" I may here observe, that when the muriate of soda is immediately applied to the wound that is made by the rattlesnake, it is a complete antidote against this poison. When an Indian is bitten by a snake, he applies a ligature above the part, and scarifies the wound to the very bottom ; he then stuffs it with common salt, and after this it soon heals, without producing any effect on the general system.

" The poison of the rattlesnake produces an immediate and obvious effect on the blood, as well as on the solids of the part to which it is applied ; but there are other noxious agents which cause death through the medium of the circulating current, without producing any apparent change, either where they are applied, or in any one part of the solid structure. Such is the case with the Wourali poison : for this noxious agent, like the venom of the rattlesnake, produces no deleterious effect when merely applied to the sentient extremities of the nerves, even on those surfaces that are most sensible. I have given it internally, in large doses, to dogs, monkeys, and other inferior animals, yet they did not suffer, even in the least ; but when we dip a small wooden needle into this poisonous juice, and then puncture with this either the flesh or any other part of the body that contains blood, almost the very moment that the poison mixes with the living blood, it destroys its vitality in the part to which it is applied ; and, if the communication with the rest of the current be not immediately prevented, this loss of vitality in one part of the blood, almost instantly extends to the whole, and the animal dies, generally in less than fifteen minutes.

" When we examine the spot that had been punctured with the poisoned needle, there is *less* appearance of inflammation or disease than if the part had merely been pricked with a common pin ; and when we examine the rest of the body, there is not the slightest trace of disease to be seen, in any part of the solid structure. Now, in this instance, it is very clear that death is not produced from any increased action, or organic disease, in the vascular organs ; and, as we know that this poison *does not possess the power of producing any direct impression on the nervous system*, we may infer that it causes sudden death by the immediate destruction of the living principle of the blood, in the part to which it is applied, and this

loss of vitality in the circulating current extends almost instantly to the whole body." Pp. 137—143.

These statements contain the essence as it were of the doctrine of Dr Stevens. Agents, poisonous or remedial, act on the blood; the former induce in that fluid certain changes incompatible with health and with life; and if not counteracted, death ensues. Remedies in the same manner may effect on the blood various favourable and beneficial changes; and in this manner may remove morbid states and restore health. The nerves, he maintains, possess no powers of absorption, and consequently cannot act in this way as poisonous agents. Even hydrocyanic acid, he argues, acts on the blood; for it is as suddenly fatal when mixed with the blood in a vein as when injected into the carotid artery. It is further as destructive to vegetables and animals without a brain as to those with it. One error only, we here observe, in the statement, that nerves are void of tubes, (p. 162); and from which the author infers that the actual agents could not get either into the blood, or from this into the secretions, merely through the medium of the nervous system. That the nerves contain tubes has been proved by the observations of Ehrenberg. At the same time, we are not prepared to say that this fact could alter the conclusion deduced by Dr Stevens. The circumstance is merely deserving notice as one which might, by a scrupulous opponent, be considered as an objection. As our object is rather to make known the views of Dr Stevens than to examine them critically, we avoid giving any opinion.

Dr Stevens comes next to the practical part of his work, the application of all his speculative views to the treatment of disease.

Dr Stevens, who spent many years as physician in the islands of Santa Cruz and St Thomas, distinguishes the essential or idiopathic fevers observed in the West India Islands into three forms. One of these, he says, is the climate or seasoning fever, which is produced neither by marsh poison nor contagion, but is caused by long continued excessive heat, acting under peculiar circumstances on the persons of unseasoned strangers, who have lately arrived from northern countries. The second is the marsh or swamp-fever in all its varieties. This disease is met with in every locality in the globe, where surfaces of stagnant water are exposed to the action of a hot sun. The third is the African typhus, or the pestilential fever of Chisholm, the Bulam fever of Sir William Pym, and the yellow fever of a variety of writers. The two former the author allows to be indigenous to the West Indies, and, so far as he has seen them, never communicable from one person to another. The last he believes to be in every instance a contagious disease. He thinks it can always be traced to importation from the African coast, or from an infected port.

We have so often in this Journal had occasion to consider the history, origin, and characters of remittent and yellow fever, that it can surprise none of our readers if we acknowledge, that we do not agree with the distinctions now established, and that we do not admit the alleged African origin of what is called yellow fever. For this it is unnecessary to assign reasons at present, as we have done so frequently already; nor do our limits permit us to enter into this complex question. We need only refer to our 21st, 28th, 29th, 35th, and 37th volumes. At the same time, the indulgence and toleration which we claim for ourselves, we willingly concede to Dr Stevens; and though we cannot adopt his views as to the origin and contagious nature of yellow fever, we are ready to listen to his propositions as regards its effects on the blood, and the remedial means by which he proposes to counteract these effects.

The distinctions given by the author may be understood from the following extracts.

“The climate fever is only met with as an epidemic during the hot months, when the thermometer is upwards of 88° during the day, and at least 80° during the night. It occurs but very seldom in swampy districts; it appears generally in dry situations, and only in solitary cases, except in those localities, where there is an accumulation of unseasoned strangers, exposed to the action of a burning sun. This disease is confined to the whites, and almost entirely to those who have arrived lately from northern countries. But the African typhus appears in the West India islands in every locality, and at all seasons of the year. It is not confined either to the whites, or to those who have lately arrived. I have known it fatal even to the negroes as well as creoles, who had never been out of the tropics. And where it does exist, in the West Indies, it is just as fatal in the coolest weather as it is in the hottest months. This disease is not produced by any local endemic cause; and where it makes its appearance in any of the islands for the first time, there is but one thing that is invariably essential to its existence, namely, an arrival from some sickly port, where the same disease had existed previously to the sailing of the vessel. After a minute inquiry into this subject, I may venture to say that there has not been even one solitary exception to this rule, either in the West Indies, or in the United States of America. And, afterwards, I may bring forward many unequivocal facts, to prove that in places where the above cause has existed, the African typhus has made its appearance in the most cleanly and healthy situations, where the same disease had never existed, until a few days after the arrival of an infected vessel.

“The marsh fever is seldom or never met with as an endemic, in the centre, or near to the wharfs of large well-built cities; while the African typhus and other contagious diseases are most fatal where there is a dense population; and the first cases of this disease, almost invariably, occur about the wharfs; or in that spot where the strangers from abroad first come into contact with the



natives. When a number of individuals are equally exposed to the marsh poison, many are attacked about the same period ; but the African typhus always begins with solitary cases, and often there is a considerable interval betwixt the primary cases and those that occur afterwards ; but when these once begin, the disease marches on with a steady pace, from the spot where it had commenced to the interior parts of the town.

"When the poison, which produces the African typhus is first evolved from the body, it appears to be almost inert ; but, by being confined in clothes or bedding for a short time, without being exposed either to the air or the sun, it undergoes changes, and becomes so virulent as to produce even the worst form of the disease, in those who are exposed to the fomites, which contain the poison, when the infected clothes are first exposed to the atmospheric air. A sailor, for example, may be attacked with this disease in the West Indies, and, during his illness, other individuals, even those who have not had the disease, may visit him while sick with the most perfect impunity ; but, if the clothes which this sailor has worn, during his illness, are packed up unwashed and confined in a chest or a bag, and carried, for example, from the West Indies to the United States, during the hot months, when the contaminated clothes are first exposed, the poison is evolved by the heat, or attracted by the air, and those who are near it are sure to be attacked with the very worst form of the same fever." Pp. 195—197.

The best means of distinguishing these fevers, especially the climatic, from yellow fever, are found, Dr Stevens maintains, in the state of the blood. In the first stage, climate fever is a disease of violent excitement ; and though, during this period, the symptoms indicate greatly increased action, yet the blood is never cupped, nor has any appearance of crust on its surface. It flows from the vein with great force, and in the first stage it is manifestly diseased (p. 206). The author thinks that it is not only deranged by the high heat and rapid motion, but also by the retention of those salts which ought to have been removed by the secreting organs. When this hot blood is drawn from the body early in the disease, it is so florid, that though drawn from a vein, it looks like arterial blood. The fibrin coagulates firmly ; yet there is no crust on the surface ; and in certain cases, even the serum, when it separates, has a bright arterial colour, which in this disease it retains for days ; for the colouring matter, according to the author, is not merely diffused but combined with the serum, in such a manner that it cannot be separated either by filtration or any other mechanical process.

The fact now mentioned, if correct, indicates, we conceive, decomposition of the blood. We have seen this mixing of the serum with the colouring matter ; but we have never seen it unless where the colouring matter had been by some means detached

from the clot, and the fibrinous part, in short, in a state of decomposition.

In the last stage of the same fever, (seasoning or climatic, we understand,) the blood is invariably black; because at this period its saline ingredients are so much diminished, that they are no longer capable of giving a red colour to the hematosine; and the blood, even in the arteries, is not only dark, but dissolved and decomposed, in consequence of which the action of the heart is greatly diminished, the secreting organs cease to secrete, and the functions of the whole economy are perverted. In severe cases the blood loses a large proportion of its fibrin and albumen, and becomes so thin, (so decomposed?) that it can scarcely be retained within its vessels; and before death it oozes from the mucous surfaces of the eyes, mouth, throat, and stomach. The saline ingredients the author represents to be so much diminished, that the blood becomes as black as ink; while the fluid is no longer capable of stimulating the heart and the other vital organs.

The characters of the blood in the alleged African typhus are scarcely given in so distinct a manner. The author quotes the accounts of Warren, Mitchill, Potter, and others; and from these it appears that the absence of size or buff, a yellowish colour and small quantity of the serum, dark colour in the arterial blood, and a peculiar acid odour, are the principal characters of the blood in that disease. The blood in the heart is black, broken down, and muddy, and does not separate into serum and clot.

All these changes Dr Stevens ascribes to the operation of a poison; the marsh poison in the case of remittent fever, and a peculiar febrile poison in that of yellow fever; and he accordingly maintains, that in the treatment of these diseases the great object of the physician ought to be to counteract these poisonous agents and their effects on the blood.

Dr Stevens expresses confidently his opinion, founded on extensive experience, that, in the treatment especially of yellow fever, large blood-letting, mercurialism, and all the methods which have been hitherto tried, are useless, and sometimes injurious; that blood-letting, merely to a small amount, and the moderate use of aperients, is more safe and more effectual; but that the great means to which the physician must trust for curing the disease and restoring his patient, consists in the exhibition of saline non-purgative medicines. By moderate blood-letting, and moderate but efficient catharsis, and abating the heat of the surface by the application of cold water by the sponge, the general vascular excitement is reduced, and all serious injury to the brain or any of the internal organs is prevented. The patients will not be cured, nevertheless; nay, they will die, unless means be adopted to act on the general mass of the circulation. All acids,

opium, antimony, brandy, and other remedies already in use, will, he assures us, be unavailing, unless the saline treatment be adopted. When the stomach is irritable, and the seat of burning heat, the alkaline carbonates are valuable. In other cases, the author has used with advantage a strong solution of muriate of soda with nitrate of potass. *Lastly*, he has found chloride of potass to be useful. The combination to which his most recent experience assigns the superiority, consists of half a drachm of carbonate of soda, one scruple of muriate of soda, and seven grains of chlorate of potass, which are to be administered every hour and a-half, until the symptoms of the disease begin to abate.

The effect of the use of this medicine the author represents to be powerful, speedy, and beneficial. In general, vomiting is allayed, sickness disappears; in some cases, even incipient yellowness is said to have retired; the secretions are re-established; and, in no long time, the pulse coming down, the patient is restored.

Dr Stevens mentions also, that, in the Tennessee country, where telluric or endemic fever is as fatal as it is at Sierra Leone, the disease has been deprived of its virulence by exhibiting the alkaline carbonates as freely as the patients can take them. Previous to this, the usual remedies were emetics, calomel, acids, bark, and the sulphate of quinine. Under the use of these remedies the mortality was great. Since the introduction of the alkaline carbonates, the mortality has been very much reduced.

Surely it may be said this is a very simple method of treating a disease so formidable; a disease which, at the present time, and for many years past, has been the great enemy to settlers along the rivers in the interior of North America. Along the banks of Ohio, the Missouri, the Mississippi, the Arkansas, in short the whole of the rivers of the interior of that great continent, the settlers for four months of the year, from June to October, are more or less assailed with this ubiquitous foe. Yet what can be more simple than a quantity of bicarbonate or carbonate of soda, or even the crude carbonate of potass obtained by burning the boughs and twigs of the timber felled and cut in the course of clearing the surface of the country? A settlement, or body of settlers, well supplied with this and with some muriate of soda, might, according to Dr Stevens, bid defiance to the sallow fiend of the swamp and prairie.

"It appears that the American practitioners have been led by successive steps and in different modes to the use of these alkaline carbonates in the treatment of endemic fevers. The speculations of Dr Mitchill of New York regarding the presence of nitrous acid, which he named *septic*, as a cause of fever, and especially yellow fever, led him to propose, in 1797, (*Med. Repos.* Vol. i. p. 253,) the administration of the alkaline salts

and earths, as effectual means of curing that disease. Among this class of remedies, however, he enumerated not only the carbonates, but the sulphates, muriates, phosphates, and tartrates. The following year, Dr Adolphus Lent, a pupil of Dr Mitchell, in an inaugural dissertation on the alleged acid properties of pestilential vapours, recommended strongly the use of alkaline remedies and antidotes; and soon after, in the course of the same year, and afterwards in 1800, Dr Barker of Portland in Maine, published an account of the effects of treating the epidemic fevers of that locality, by administering chalk, lime-water, and carbonate of potass, after and with suitable purging.

After this period, the administration of alkaline remedies came into use among American physicians; and while Currie and Hosack recommended lime-water in frequent small doses with milk, to check black vomit, Harris, Vaughan, and Seaman employed the alkalis, especially the carbonate of soda, which was recommended by the editors of the *Medical Repository*, (Vol. iii.); and Archer, in 1804, wrote in favour of the carbonates of lime, magnesia, and potass, as curative and preventive remedies. In this manner the employment of alkalies, and especially the carbonate of soda, appears to have been adopted by many who could not trace the introduction, or assign the principle on which it was given. It appears, at least, that the practice has been employed for several years at Rochester, in the Tennessee country, where the lake fever is very fatal; and that Dr Henry of that town has long been in the habit of administering large doses of carbonate of soda in the treatment of yellow fever, without any specific object, but simply from having found, that cases so treated recovered more easily and more frequently than those in which this salt was not administered.

Dr Stevens, in his anxiety to prove the beneficial effects of carbonates, gives several examples of the detrimental effects of acids. We believe that acids are hurtful, and there may be certain states of the system, yellow fever being among them, in which acids are particularly detrimental.

What are the therapeutic effects of this treatment? Dr Stevens states in general that, on an average of the fever cases treated by saline medicines either by Dr Stedman or himself, forty-nine patients out of fifty recovered. It appears further, that in 1828 yellow fever prevailed epidemically at Trinidad; and there Mr Greatrex, under Dr Hacket, was induced to make trial of the practice. According to the statement of the result as given by Dr Stevens, during the first month after his visit to Trinidad, from forty to fifty cases were admitted into the hospital; and all were treated with muriate of soda and nitrate of potass. Out of this number three died; and all the rest, he believes, recovered. It

is true, that it appears that some mismanagement or misunderstanding as to the exact kind of treatment to be pursued had at first taken place; for it appears that by some means or other carbonate of soda instead of muriate of soda had at first been given to the patients. Afterwards the saline treatment, as recommended by Dr Stevens, was adopted. In the former period, though the mortality was diminished, it was not much diminished. In the latter it was greatly so.

The chief conclusion that results from the facts now stated is, that the remedy has not been fairly tried, and has met with opposition, if not been treated with misrepresentation. We have no desire at this distance of time to revive the controversy. But it is clear that unless the treatment is subjected to fair trial, with all the conditions prescribed by Dr Stevens, it is utterly impossible to appreciate its merits correctly. We are decidedly of opinion, that where a new method of treatment is proposed, it ought to be subjected to fair and complete trial, and treated with neither neglect, opposition, nor misrepresentation. Dr Stevens has, we think, made out a case sufficiently strong to demand the attention of medical men in the West India Islands and similar situations, where endemic fever prevails; and if they do not avail themselves of the benefits of a method of treatment which has at least the recommendation of being simple and harmless, that is not the fault of Dr Stevens.

The only objection which, it occurs to us, can justly be urged against the treatment is, that the success seems too great, considering the nature and usual fatality of the disease. When only three persons die out of fifty cases of alleged yellow fever, many persons knowing how unmanageable that disease is, may assert, that either the whole of these fifty cases were not yellow fever, or that the treatment could not have had the effect of restoring forty-seven persons. At the same time, we think it neither prudent nor just to pronounce a positive opinion without more full information and more extensive trials of the method of treatment.

In the fevers of this country, we have tried the saline treatment, and seen it tried by others. It has a remarkable effect in clearing the dingy colour of the skin, even in typhus; and, though it is not clear to us, that alone it is capable in severe cases of curing the disease, it must be regarded as a valuable auxiliary to other means.

Lastly, it appears to us that Dr Stevens is entitled to a much higher degree of credit than he has yet received, for directing the attention of the profession to the subject of the state of the blood in disease. It is of no consequence whether all his views are correct or not. Some of them seem to be perfectly correct; and all of them are highly ingenious. But their great merit is, that they

direct the minds of medical observers to points hitherto overlooked ; and that by thus opening up a new line of inquiry, they cannot fail to lead inquirers to results valuable in practice. Since the publication of his work, many inquirers have entered on this new field of investigation. Andral and Gavarret have written a whole treatise on the subject. Roesch has published a good condensed view of the morbid states of the blood, their causes and effects ; and numberless writers have contributed short essays on different divisions of the subject. All this perhaps cannot be ascribed to the influence and example of Dr Stevens only. But it must be remembered that he was the first and earliest investigator ; and that his treatise contains many important facts and inferences, the accuracy of which has not hitherto been disproved.

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ART. II —1. *De Glandularum Secernentium Structura Penitiori, Earumque prima formatione in Homine atque Animalibus.* Commentatio Anatomica. Scripsit JOANNES MUELLER, M. et Ch. Doct. Med. in Universitate Literarum Fridericia Guilelmia Rhenana Bonnensi Professor, &c. Cum Tabulis Aen. Incisis xvii. Lipsiæ, 1830. Folio, pp. 131.

*On the Intimate Structure of the Glands, and their first Development.* An Anatomical Commentary, by JOHN MUELLER, M. D. A. Ch. Professor of Medicine at Bonn. Illustrated by 17 copperplate engravings.

2. *On the Structure and Uses of the Malpighian Bodies of the Kidney, with Observations on the circulation through that Gland.* By W. BOWMAN, F. R. S., &c. Received February 14, read February 17, 1842. Philosophical Transactions for 1842. Part I. London, 1842. 4to, p. 57.

3. *Bericht über die Fortschritte der Mikroskopischen Anatomie in dem Jahre 1842.* Von K. B. REICHERT, Prof. in Dorpat. In Muller's Archiv für Anatomie, Physiologie, und Wissenschaftliche Medicin. Jahrgang, 1843. Seite clxxx.

*Report on the Progress of Microscopical Anatomy in the year 1842.* By K. B. REICHERT, Professor of Medicine at Dorpat. Muller's Archiv, 1843.

4. *Beiträge zur Strukturlehre der Niere.* Von Dr JOSEPH GERLACH, prakt. Aerzte in Mainz. Archiv für Anatomie, Physiologie, und Wissenschaftliche Medecin, von Dr J. Mueller. Jahrgang 1845, N. IV. Seite 378.

*Contribution to the Knowledge of the Structure of the Kidneys.*

By Dr JOSEPH GERLACH, Physician in Mainz, (Mayence). 1845.

5. *Ueber die Malpighischen Körper der Niere.* Von F. BIDDER in Dorpat. Muller's Archiv, 1845. Heft V. Seite 508.  
*On the Malpighian Bodies of the Kidneys.* By F. BIDDER of Dorpat. 1845.
6. *Ueber Flimmer bewegungen in der Primordial Nieren.* Von A. KOLLIKER. Muller's Archiv. Heft V. Seite 518. 1845.  
*On the Ciliated Motions in the Rudimental Kidneys.* By A. KOLLIKER of Zurich. 1845.
7. *On the Intimate Structure of the Human Kidney, and on the changes which its several component parts undergo in Bright's Disease.* By JOSEPH TOYNBEE, F. R. S. Read 23d June 1846. Medico-Chirurgical Transactions, vol. xxix. p. 303. London, 1846. 8vo.
8. *On the Minute Anatomy and Pathology of Bright's Disease of the Kidney, and on the relation of the Renal Disease to those Diseases of the Liver, Heart, and Arteries, with which it is commonly associated.* By GEORGE JOHNSON, M. D. Read 11th November 1845. Medico-Chirurgical Transactions, vol. xxix. p. 1. London, 1846. 8vo.
9. *Ueber die Bright'sche Nierenkrankheit.* Eine Akademische Abhandlung von PETER H. MALMSTEN, der Medecin und Chirurgie Doctor. aus dem Schwedischen übersetzt und mit einigen Anmerkungen versehen von GERHARD von dem BUSCH, D. M. et Ch. zu Bremen. Bremen, 1846. 8vo, pp. 168.  
*On Bright's Disease.* An Academical Treatise by PETER H. MALMSTEN, M. and Ch. D. Translated from the Swedish by GERHARD von dem BUSCH, M. and Ch. D. Bremen, 1846.

ON no subject in general anatomy has information been so void of precision and accuracy as on the structure of the glands. By several anatomists the structure has been believed to be the same in all; and consequently, what was supposed to be ascertained as to one has been applied indiscriminately to all. Little, indeed, was ascertained; and few accurate facts were recorded. Sylvius and Steno, Glisson\* and Wharton,† were the principal inquirers

\* Francisci Glissonii Anatomia Hepatis. 12mo. Londini, 1654.

† Thomæ Wharton Adenographia seu Glandularum totius Corporis Descriptio. 8vo. Londini, 1656.

previous to the time of Malpighi; and both the two latter did communicate some information. These anatomical results, however, were much influenced by various physiological notions on the nature of secretion; and as the latter were often erroneous, the former were rarely in all points correct.

Malpighi, in 1661, taught that all glands consisted of an aggregation or collection of minute saccular organs, (*utriculi*), in which the blood-vessels were distributed, and which saccular organs he denominated sometimes small glands, (*glandulæ*), sometimes *acini*. *Acini* in the liver he represents to consist of simple glandules collected in clusters, which glandules are hollow membranous cavities. These *acini* are in shape hexagonal or polyhedral. The glandular bodies in the kidneys, on the other hand, are round or spherical like the ova of fishes; but these *glandulæ* are in like manner hollow.\*

Ruysch was confident that the final structure of all glandular organs consisted in *fasciculi* of blood-vessels ramified to an infinite degree of minuteness. He admitted, indeed, in 1722, when eighty-five years of age, that sixty years previously he had taught the existence of *acini* or little glands with membranous cavities, according to the received opinion. Afterwards, however, by much observation in injection, he became convinced that these *acini* are composed of blood-vessels only, and not of little hollow membranes with an outlet.† He allows, nevertheless, that the liver contains *acini* or *acinuli*; but repeats his doctrine, that these are not small glands or hollow sacs, but very delicate pulpy vessels.‡

Ferrein, in the middle of the 18th century, called in question both of these doctrines. He maintained that the liver and the cortical part of the kidney consist neither of blood-vessels nor of small glands, but of a peculiar substance formed by a wonderful collection of white cylindrical tubes variously folded, which, he contended, he demonstrated manifestly in the kidneys,—which he had seen in the liver and renal capsules, and which he believed he could make known in other glandular organs.§

\* Marcelli Malpighii Exercitationes Anatomicæ de Structura Viscerum; nominatim, Hepatis, Cerebri Corticis, Renum, Lienis. Cum Dissertatione de Polypo Cordis et Epistolis Duabus de Pulmonibus. Apud Opera Omnia. Tomum Secundum. Folio. Londini, 1687.

† Opusculum Anatomicum de Fabrica Glandularum in Corpore Humano, Continentes Binas Epistolas, Quarum Prior est H. Boerhaave, super hac re, ad Friedericum Ruyschium; Altera F. Ruyschii ad H. Boerhaave, Qua priori respondetur. Amstelædami, 1721 et 1722. Apud Ruyschii Opera Omnia, Tomum iv. p. 71. Amstelædami, 1733, 4to.

‡ "Acini ibi (in hepate) manifesti semper sunt agniti a me; sed ego tantum dixi, quod non sunt folliculi membranacei cavi cum emissario, sed quod sint vascula pulposa tenerissima." Epistola, p. 75.

§ Observations sur la Structure des Glandes, et part. des Reins, et du Foi. Memoires de l'Academie Royale des Sciences. Paris, a 1749. Hist. p. 92. Mem. p. 489.



Haller has collected under the several heads of the pancreas the liver, the kidneys, the *testes*, the *mamma*, and other glands the results of the inquiries of different anatomists to his own time (1777.) In the liver he admits the existence of *acini*, and he adopts the view of Malpighi, representing them to consist of simple hollow glandules collected in clusters; that these *acini* are hexagonal; and are not an element but a mass of elements; or, in short, that they are the lobules of the liver enclosed in cellular tissue.\*

Each kidney he represents to consist of several little kidneys (*renculus*); each of which, again, consists of cortical or vascular and medullary or striated matter.†

In 1788 Schumlaniski published his dissertation on the structure of the kidney, and thereby directed attention to the arrangement both of the cortical or vascular part of these glands, and to that of the *tubuli Belliniani* or excreting ducts. He did not, however, elucidate much the intimate structure of the organ.‡

The facts and statements given by Haller were very generally repeated by Soemmering and other anatomists. Bichat alone rejected many without substituting others in their place, and maintained that whatever could not be sensibly demonstrated was to be regarded as uncertain and undeserving attention.

Various inquirers continued to investigate this department of anatomy, with different degrees of success, during the first third of the 19th century. In 1818 Eysenhardt published his dissertation on the structure of the kidneys, in which, with various errors, he gave correct views of the *corpora Malpighiana*.§ In 1819 Doellinger, in a dissertation on secretion, adduced several curious facts regarding the arrangement of arteries in several glands.|| These were followed by the essays of Rathke and Huschke on the structure of the kidneys, the observations of Weber on the salivary glands, and those of Baer on the liver. The researches of all these inquirers, however, though most valuable, have been in a great degree eclipsed by the elaborate commentary on the glands, published in 1830, by John Muller, first of Bonn and afterwards of Berlin, who has, with great skill and much personal research, elucidated the structure of all the glands in a systematic manner, combining the researches of his predecessors. Since the date of the monograph of Muller, various facts of considerable value, chiefly microscopical, have been added by subsequent observers

\* *Elementa Physiologiæ*, Lib. xxvi. Sect. I. § xxvi. xxvii.

† *Elementa*, l. ib. xxvi. Sect. I. § vii. and viii.

‡ D. Alex. Schumlanisky *Dissertatio de Structura Renum*. *Tractatus Physiologico-Anatomicus*. Edente G. C. Wurtz. 8vo. Argentorati, 1788.

§ Carol. Guillem. Eysenhardt *de Structura Renum*, *Observationes microscopice cum Tab. æn.* 4 Maj. Berolini, 1818.

|| Was ist Absonderung und wie geschieht sie. Wurzburg, 1819.

both on the structure of the liver and the kidneys. It is principally, however, to the latter subject that we are at present to direct attention, and to take a short view of the progress of anatomical and pathological investigation into the structure of the kidney, and the state of that gland in granular degeneration.

Muller distinguishes all the glands of the animal body into nine orders, in the following manner.—

#### I. GLANDS OF THE FIRST AND MOST SIMPLE ORDER.

1. **CRYPTS OR CELLS.** a. Solitary crypts of the mucous membranes. b. Aggregated, agminated, or agglutinated crypts, as the glands of Peyer in the intestines.
2. **FOLLICLES OR PEDUNCULATED VESICLES.** a. Solitary, as those of the skin. b. Associated, as the aggregated follicles in the auricular glands of amphibious animals.
3. **ELONGATED BLADDERS, (UTRICULI ELONGATI,) sacs, or CÆCA.** This glandular apparatus consists in the eversion of a simple membrane, which is prolonged without contraction or terminal enlargement.

These are either, a. simple *intestinula*, occurring in the mucous membranes, or b. aggregated *intestinula*, like the Meibomian glands of mammalia, and the glands of the stomach of birds.

4. **TUBULI OR BLIND SACS; (CÆCA.)**

These are either, a. solitary **TUBULES**, as the secretory organs of several insects; or b. aggregated **TUBULES**, as the glands of the oviducts of the ray and shark, consisting of parallel **TUBULI**, the cesophageal glands in certain birds, and the pyloric appendages of some fishes.

#### II. GLANDS OF THE SECOND ORDER. COMPOUND CRYPTS. FOLLICLES. INTESTINULES. COMPOUND TUBULES.

1. **COMPOUND CRYPTS, or COMPOUND CELLS**, in which several crypts are united.
  - a. Berry-like crypts, as in the anal glands of the hyena.
  - b. Bladders with cells, (*CRYPTÆ LOCULATÆ*), as in the præputial glands of the dormouse.
  - c. Tubules with internal cells, as the salivary glands of some insects.
  - d. Flower-like crypts, or crypts united as flowers, as in the testicles of insects.
2. **COMPOUND FOLLICLES, or COMPOUND PEDUNCULATED VESICLES.** Follicles united in various modes.
3. **COMPOUND CÆCA.** Intestinal *cæca* united in various modes.
4. **TUBULI COMPOSITI.** Tubules or hollow cylinders united in various modes.

III. GLANDS OF THE THIRD ORDER ; COMPOUND CELLS, FOLLICLES, INTESTINULES. *Compound Tubules* united so as to form one glandular sac.

IV. GLANDS OF THE FOURTH ORDER. GLANDS COMPOSED OF SPONGY CELLULAR TEXTURE, variously arranged ; sometimes in the form of tubules, sometimes of cells, sometimes of glandular cells inclosed within membranous partitions (*septa*.)

V. GLANDS OF THE FIFTH ORDER. LOBULATED GLANDS COMPOSED OF AGGREGATIONS OF SMALL INTESTINAL CÆCA.

1. A gland composed of clusters of small intestinal cæca arranged in lobules, as the pancreas of the tunny.
2. A gland composed of blind branching *intestinula*, arranged like leaves in lobules ; for instance, the prostatic glands and Cowper's glands in the hedgehog.
3. A gland composed of branched *intestinula cæca* irregularly arranged.

VI. GLANDS OF THE SIXTH ORDER. BRANCHED EXCRETORY DUCTS INCLOSED FROM THEIR ORIGIN TO THEIR TERMINATION BY ELEMENTARY PARTICLES.

This arrangement, which resembles efflorescence, is not terminal, but is similar to the *protracted efflorescence* of botanical terminology. Of this examples are found in the liver of the *crustacea*, the lacrymal gland of the tortoise, and the lacrymal gland of birds.

VII. GLANDS OF THE SEVENTH ORDER. COMPOUND RAMIFICATION IN A LOBULATED GLAND, WITH TRUNKS OF EXCRETORY DUCTS CONTINUOUS AND ENTIRE AMONG LATERAL BRANCHES AND VESICULAR ENDS OF ULTIMATE DUCTS.

The trunk of the excretory duct, entire and continuous, is not divided into branches, but sends out laterally small branches, which are also continued entire and without interruption by lateral ramification. The result of this arrangement is great, small, and very small lobules ; because each trunk with lateral branches makes a large lobe ; branches with lateral sprigs make small lobes of the second order ; and from the twigs, and their attached portions, the smallest lobules arise. This origin of the lobules is shown from the history of the development of the embryo.

To this mode of arrangement belong the salivary glands, the pancreas, the *mammæ*, and the lacrymal gland of many MAMMALIA.

**VIII. GLANDS OF THE EIGHTH ORDER. COMPOUND RAMIFICATIONS IN GLANDS NOT LOBULATED WITH DIVISION OF TRUNKS INTO IRREGULAR BRANCHES, WITH SHORT OR TERMINAL VESICULAR TWIGS, (as in the pancreas of birds, and in the liver of the embryo of birds and mammalia.)**

**IX. GLANDS OF THE NINTH ORDER. CONSISTING OF SHORT TUBULES AND VESSELS, NOT RAMIFIED.**

The elements of the glands in this order are tubules long and very long; of equal diameter to their short ends; either straight or serpentine. At the origin they are often furcated; after that simple without giving branches. They appear under six forms.

1. From a lateral excretory duct arise bundles of tubules, as in the kidneys of many fishes, and batrachoid animals, and in the *testes* of fishes. The tubules proceed either parallel towards the opposite margin, as in the kidneys of the petromyzon and frogs, and the *testes* of fishes; or they wind tortuous and serpentine, as in the kidneys of the ray family and serpents.
2. Bundles of parallel tubules everywhere issue from branching excretory ducts. Such are the kidneys of the crocodile and tortoise.
3. An excretory duct divided into very long uniform serpentine vessels; as the seminiferous canals of the higher animals, and the prostate glands of the hedgehog.
4. Tubules forked and fasciculated like rays or wheel-spokes, proceeding from an excretory duct; as in the *testes* of frogs and cuttle-fish.
5. Very long vessels; pinnatifid at apex; closed; rising in bundles from a branched excretory duct; as in the kidneys of birds.
6. Very long vessels rising in bundles, at first bifurcated, then pursuing a serpentine course without branches. The kidneys of the mammalia and man. The proportion between the ureter and the uriniferous ducts varies in three modes.
  - a. The ureter is continued to branches; from these arise bundles of uriniferous ducts arranged in separate lobules, externally serpentine, as is seen in the kidneys of the cetacea.
  - b. One single ureter passes into a pelvis and *calyces*, which receive the bundles of the uriniferous ducts. These bundles are evolved in the lobated kidney, externally serpentine; but the lobules are not altogether separated, as in the kidneys of several mammalia.
  - c. In the kidneys of the rest, even the superficial lobes of the kidneys disappear.

The kidneys are referred by Henle to the head of Reticulated or Net-like glands.

The substance of the kidneys in fishes consists of long canals of equal diameter, which arise from branches of the ureter, or parallelly in bundles from the lateral ureter, and proceed sometimes straight, sometimes in a sinuous course variously contorted, without being divided into branches, which are not attenuated towards the extremities, but terminate uniformly in short ends.

In reptiles, the *vesiculæ* or bladders of the secreting apparatus, or ends of the uriniferous ducts, arise before the ureter itself is distinctly seen. This seems to show that the development of the kidneys begins from the peripheral vesicles. The stalks of these vesicles are prolonged distally, by which the tubules terminated by vesicular rounded *apices* arise, while the *vesiculæ* themselves are more and more attenuated, until the uriniferous ducts observe the same diameter to their shut end. In short, in this order of animals, the substance of the kidneys consists of equal cylindrical tubules rising from the ureter and ascending to the outer margin of the kidney, where they terminate in short extremities.

In adult serpents, the kidneys consist of many lobules, which are connected in order by the ureter, which passes along the internal margin. The lobules on the flat surface of the kidney are less distinct than those on its convex surface. All the lobules, however, are very closely connected. The lobulated appearance, indeed, is the result of the undulated flexures of the renal mass. When the substance, inflected in the undulated fashion, is confined and contracted by the ureter, each lobule consists of a convoluted tract, or of a sort of arch, with a median furrow left. Into these median furrows on the one side enter the bundles of the uriniferous ducts, and on the other the blood-vessels. And as the lobules arise by alternating flexures, the bundles of the uriniferous ducts being on the one margin, and the vascular trunks on the opposite one, the former are mostly distributed on the convex surface, and the latter on the plane surface of the kidneys.

The kidneys of the crocodile are also lobulated; but the lobules are not attached in order to the ureter, as in serpents, but are united into an irregular mass, and receive the ureter internally. All the lobules are contorted, and surround the surface with winding *gyri*. When a kidney is divided transversely on the surface, through the *gyri* of the lobules, the section of the lobule or *gyrus* is pyramidal. This shows that the *gyri* of the lobules project with an external acute border, and are united internally at their bases, where they receive the branches of the ureter. The ureter itself appears to be ramified on the deep substance of the kidney, so that the branches pass everywhere into internal *gyri*, according to the arrangement of the lobules.

In Birds at the first period of development, when, besides the heart and the first rudiment of intestine, the other bowels of the trunk are not yet visible, on each side near the vertebral column appears an elongated body, extending from the site of the heart, almost along the whole keel of the embryo. This body observers first mistook for the kidney. Rathke showed, however, that this body is peculiar to the embryo; that it precedes and prepares for the formation of the testes and ovaries, and then, as the fœtus advances to maturity, it becomes shorter, and at the close of foetal life, vanishes entirely. These bodies, which were first described by Wolff, and therefore received the name of Wolffian bodies (*Corpora Wolffiana*), and by Burdach were called *spurious kidneys*, consist at first of elongated pedunculated vesicles, which being arranged transversely, issue from one common marginal excretory duct, which are gradually elongated into very small *intestinula cæca* or tubules, also transversely placed. These tubules, at first straight, are gradually curved, until their course becomes serpentine. They are, however, at all times separated from each other, and without trace of ramification.

Rathke observed the first rudiment of kidneys on the sixth day, and the ureter in the form of a slender filament on the seventh day; while the Wolffian bodies are still of considerable size, and have extended the whole length of the keel on the fourth day.\* It is further ascertained, that the Wolffian bodies already present the characteristic structure, namely, transverse tortuous *intestinula*, when the first traces of kidneys, like a mass of very tender grey substance, appears close to and behind the Wolffian bodies.

It is the opinion of Rathke, that the substance of the kidneys is formed from the Wolffian bodies, because, on the sixth and seventh day of incubation, when these bodies are detached from the keel, the kidneys adhere, not to the keel, but to the Wolffian bodies. The view of Müller is different. The Wolffian bodies, according to him, however, similar to the kidneys in Batrachoid reptiles, yet differ entirely in texture from the kidneys in other AMPHIBIA and in BIRDS; the first trace of uriniferous ducts being widely different from the *intestinules* of the Wolffian bodies. Müller further never could recognise, after very frequent observation, any internal and organic communication between these organs; the closed *intestinules* of the Wolffian bodies being at one part, and at another the uriniferous ducts, arranged in brilliant convolutions, also closed and whitish. Another circumstance which places this question out of all doubt is, that in Batrachoid AMPHIBIA, the Wolffian bodies, though at first sought in vain, Müller found in the upper part of the abdomen, where, at a great

\* By the *Carina* or Keel is meant the Vertebral Column or what represents it.

distance from the kidneys, they are provided with their excretory duct, and consist also of minute *cæca*. From these facts Müller infers, that the Wolffian bodies have an intimate connection with the development of the organs of generation, as Rathke first suspected.

The substance of the kidneys, on the other hand, is formed from its own proper blastema or primordial matter, by an innate effort.

When the mass of grey substance, situate at the margin and behind the upper part of the Wolffian body, is examined at its appearance by the microscope, the surface is distinguished by a vermicular eruption and varied appearance of *gyri* or convoluted lines, which are in different parts convex and concave; and these *gyri* again converge everywhere into the foliated form, like the leaves of the oak, fig tree, or cauliflower, variously arranged with undulated margin. The whole kidney at this period consists of mere leaf-like convoluted *gyri*. These *gyri* form the uppermost part of the substance; but they are continued inwards, as if they were held together in the deep-seated substance by one common mesentery. When the small masses deeper in the middle, undulated at margin, and also beyond the margin, are arranged like leaves, the observer thinks he sees the elementary particles of the renal substance in the prominent lobules of the *gyri*.

At first the *gyri* of the masses appear everywhere with unequal margin. Soon, however, by the aid of the microscope, there is seen on the tortuous border a vesicular eruption like pearls; that is, in the very tender substance of the tortuous border, round corpuscles are contained one after the other; but when these are carefully examined, they are found to be round on the margin only; and below, where the *gyri* penetrate into the interior substance, these corpuscula also descend, and in their course become smaller, as the pedunculi proceed from the deep-seated substance, and are unfolded variously on the tortuous and curled border of the *gyri*. These pedunculated corpuscles are whiter than the rest of the very tender substance, and are arranged one beside the other in very regular order, held together, as it were, by one common mesentery, which, folded and contracted inwardly, but outwardly unfolded by innumerable *gyri* and a tortuous margin, produces a remarkable resemblance to the arrangement of leaves and lobules. In the same manner the *pedunculi* meet in various points in the deep-seated substance, and outwardly are unfolded in the undulating fashion, terminating in a vesicular or headed end. These pedunculi, though approximated internally, are not really united, but merely approximated in the contracted membranous substance. This may be regarded as the earliest conformation in most embryos.

The arrangement, therefore, is, that the appearance of granules takes place first on the margin of the *gyri*; while the vesicles with peduncles are in the deep-seated substance.

The further development consists in this, that the *gyri* of the uriniferous ducts increase daily, and the undulated margin is contracted into several contorted lobules, whence a more profuse leaf-like vegetation results, so as to fill the intervals between the *gyri*; and the leaf-like shape of the lobules is gradually obscured. The kidneys now are parted into several distinct masses united by the ureter.

At length all the uriniferous ducts send out near their ends several lateral knots, from which arise short branches scarcely smaller than the trunk, and terminate in short ends. This causes the pinnatifid shape in the apex of each uriniferous duct. These ducts, pinnatifid at end, are quite separate from each other, and though arranged in regular order, have no mutual communication.

About the close of foetal life, the uriniferous ducts, at first white, are now everywhere filled with a secretion which from being tawny becomes bright white, which fills the canals almost to their ends, and is best seen in the first days after hatching; and in the young of large birds shows beautifully the structure of the uriniferous ducts on the surface of the *gyri* and lobules.

The kidneys of the adult bird are not only divided into several masses, but these present a surface composed of innumerable minute lobules. These lobules arise from continuous *gyri* variously arranged; the margins of these *gyri* only project, whence the multiform surface, viewed through the microscope, seem to imitate nearly the *gyri* of the convolutions of the brain.

The kidneys of the bird, after being hatched, require no injection to demonstrate the disposition of the uriniferous ducts. Being naturally filled with white solid urine (urate of ammonia), they may be observed in large birds, especially ravens, by the naked eye, in the first, second, third, and fourth day after hatching. All the uriniferous ducts, to their most remote pinnatifid extremities, are swelled with whitish-yellow matter, their proper secretion, consisting of uric acid.

It is difficult to convey a distinct and correct idea of the arrangement now described without figures. But it may appear to be compared to that produced by a long frill or ruffle of muslin or cambric which is doubled up and folded on itself six, eight, or ten times, with the frilled edges allowed to project, and all within an oval or elliptical space of half an inch or less.

By micrometrical measurement, the terminations of the uriniferous ducts are about  $\cdot 00174$ , that is,  $\frac{1}{57000}$  of one Paris inch in diameter. This is much larger than the diameter of the blood-vessels. Supposing the diameter of the smallest blood-vessels to



be 0.00025, or  $\frac{1}{4000}$  of one Paris inch, then they are seven times smaller, or the ducts are seven times larger.

In MAMMALIA, the following are the most important facts to be known in the development and structure of the kidneys.

In the embryo of MAMMALIA as well as of BIRDS, Wolffian bodies are observed; and as they are largest in the earliest period of embryal life, they have by Dzondi and others been mistaken for kidneys. They consist, as in birds, of very slender closed *intestinula*. In the younger embryos they are larger than the kidneys, and then chiefly simulate these organs; afterwards they are confounded with the testicles, being lower in situation and of the same size as the kidneys, so that it is difficult to distinguish between the three organs. They differ from the kidneys in MAMMALIA in being covered by an external envelope, on removing which the *intestinula* protrude, arranged transversely.

The kidneys are rounded. In the sheep they present vessels shooting from the notch or umbilicus (*hilus*) towards the circumference in bundles, which are divaricated in arch-like folds and retorted, yet all terminate in large *vericulæ* pedunculated and hollowed.

In almost all embryos of MAMMALIA, the kidneys consist of multiplied lobules in which the same arrangement of pedunculated and closed tubes is presented and repeated in various forms. In some animals this multiplied division or lobulated form of the kidney is retained through life. In others, certainly the greater number, the kidney appears in the shape of one general organ; but this is caused merely by its external appearance, or, to speak more accurately, by the arrangement of the cortical matter outside. In the human foetus the lobulated arrangement is manifest, and is in certain instances continued after birth; but in most instances the kidney appears like one undivided organ.

This difference further is of use in illustrating the anatomy of glandular organs in general. The lobulated or divided state is continued through life in certain animals, as the ox, the bear, the badger, and several of the cetacea, especially the porpoise. In these animals the kidneys consist not of one united mass, but of a number, more or less considerable, of separate bodies, each presenting and repeating the same internal structure.

Thus in the ox the kidney consists of a series of sixteen or seventeen lobules or separate parts, each of which presents the following arrangement from the pelvis or common excretory cavity. First is a large but short duct or canal lined by a membrane continuous with that of the *pelvis*; this terminates in a shut or closed cavity called cup (*calyx*) or funnel (*infundibulum*). Into this cavity projects a small conical eminence, (*papilla*), with an aperture in its apex. From this, urine may be made by pressure to

exude; and when the *papilla* is divided by a longitudinal section, it is observed that one short duct from which the urine issues, is the termination of a great number of small capillary tubes which are disposed longitudinally, yet radiating or converging towards the small papillary duct. These are the uriniferous ducts of Bellini; (*tubuli Belliniani*).

At these upper or peripheral ends is placed a species of structure which is parenchymatous and granular in aspect but vascular in arrangement, that is, it consists mostly of blood-vessels ramified to an infinite degree of minuteness and delicacy. On the mode in which these vessels are arranged at their terminations, Muller states that the arteries terminate in a very minute and delicate vascular or capillary network, which lies between the closed ends of these tubes, and that from this network again veins arise as in other textures of the body.

The papillary cone, which is about half an inch from base to apex, and rather less than half an inch at base, consists of firm solid matter, the colour of which is white or pale gray. Its exterior structure is formed of numerous tubes uniting and converging from the base to the *papilla* or apex.

Beyond this the substance of the tubular part is of a bright pink colour, less firm, but more distinctly consisting of multiplied tubes placed close to each other, and converging from the base to the segment of the frustum, on which the papillary portion rests.

In the bear and badger, these separate lobules or diminutive kidneys are still more numerous; but the internal arrangement is quite the same.

In the dolphin and porpoise the same multiplied division is carried to a very great length. The masses called kidneys in these animals consist of an immense number of tetrahedral, trapezoidal, or hexadral small bodies, connected to each other by cellular tissue and blood-vessels not very firmly, and in such manner that they may be easily separated. The number of these *rencoli* it is difficult in the CETACEA to fix. The author of this article has numbered more than 200, yet has not exhausted them. Each *renculus* presents the internal tubular or medullary portion, consisting of multiplied tubules placed along over each other, and the external cortical or vascular portion consisting of blood-vessels most minutely ramified.

When in any of these simple or integral kidneys the aperture of the *papilla* is examined, it is found to be continued into a short thickish tube not larger than one line or one line and a-half, which then is divided into two small cylindrical trunks. These again, after a short space, are divided into two others of the same diameter almost, very different from, and much larger than blood-vessels. Thence they advance dichotomous, cylindrical, straight,

or deviating little from the straight direction, and in their course constantly double and multiply themselves to the base of the *papilla*, being conjoined by tender cellular substance. When increased in number, without being diminished in diameter, they are collected into one or two bundles separate from each other by blood-vessels. Each of the bundles enters then its own meatus formed by the vascular plexus of the vault or arch. After this, the small ducts contained in their respective fasciculi, and connected with each other, are no longer dichotomous, but proceed singly in the same direction through the substance of the cortex, whence they diverge laterally, and in a serpentine course, contorted in numerous convolutions, and wandering far from the branches. One single serpentine duct, continued from the straight duct, not inserted into the same, deflected laterally, preserves almost always the same diameter and whiteness.

These uriniferous ducts further are continued into the cortical part of the kidney, a fact first ascertained by Schumlansky, and afterwards by Huschke, by injecting them under the receiver of the air-pump. According to Schumlansky, as the straight ducts or Bellinian tubes advance to the periphery of the kidney they diminish in number, or rather they terminate in serpentine ducts, which, with many windings and convolutions, proceed between the few and diminishing straight ducts onwards to the periphery or extreme edge of the cortical matter. Before the straight ducts reach this point or line, all of them have terminated in serpentine ducts which communicate by multiplied arches, so that at the peripheral edge of the cortical matter no straight ducts exist.

Not essentially different is the account given by Huschke. According to his account, when the tubes reach the utmost limits of the medullary matter of the organ, they proceed progressively, separating from each other, until in the surface of the kidney they begin to wind in serpentine directions, forming arches with each other, and again turn backwards and are insensibly lost, becoming still more minute, yet without entering the Malpighian tubes.

The mention of these objects renders it necessary to explain what they are.

Though Eustachi appears to have maintained the existence of a sort of minute glandular grains in the kidney, Malpighi was the first who spoke of them distinctly and confidently. He states that in all the kidneys examined by him, in quadrupeds, the tortoise, and in man, he observed a cluster of minute glandules by the following means. A black fluid, mixed with spirit of wine, was injected into the renal artery, so as to cause the whole kidney to be swelled and of a black colour externally. Then on stripping off the external membrane, there appeared attached here and there to the dividing arteries small glandules stained of a

black colour ; and on making a longitudinal section of the kidney, it was possible to observe between the bundles of the urinary vessels, (i. e. the ducts), and in the spaces thereby formed, the same glands, almost without number, attached to the blood-vessels, distended with the black fluid, like apples suspended to the branches of a tree.\* He afterwards adds that these bodies are placed in the utmost region of the kidney in almost countless numbers ; that he thinks it likely that they correspond to the urinary vessels of which the mass of the kidneys consists ; that as to shape, by reason of their minuteness and remarkable translucency, though they cannot be said to be said to be distinctly circumscribed, yet they appear round like the *ova* of fishes ; they are blackened when a dark-coloured fluid is injected into the arteries ; and they are placed among the extreme branches of the arteries, which wind round them like tendrils, so that they appear surrounded by the former, with this exception, however, that the portion attached to the arterial branch is black, while the rest retains its own colour.†

In these injections, Malpighi explicitly states, that he never saw the liquor thrown into the artery, though it blackened the nearest portion, get into the urinary ducts, or the round masses which he considered as the glandules of the kidney. This agrees with what is long afterwards maintained by Müller.

The round or globular bodies thus described by Malpighi were seen afterwards by Winslow, Ferrein, Schumlansky,‡ Eysenhardt, Husckhe, Müller, Henle, Bowman, Gerlach, Bidder, and in short, all those who have studied the minute anatomy of the kidney. They have been denominated from the anatomist who first directed attention to them *Corpora Malpighiana*.

At the same time it must be observed, that, whether from some confusion of ideas, or from presuming that these bodies must be well known, almost all those who have spoken of them have given them different names at different times, so that it is difficult to know whether all understood the same objects. Rusych, for example, regards these round or globular bodies as balls of the extremities of blood-vessels (*glomeres vasculorum*) convoluted on themselves, and not as glands ; nor does he allow that they are surrounded by any membrane. Similar opinions were entertained by Berger and Vieussens, and especially Peyer, who contended

\* De Renibus, Caput II. apud Opera Omnia, pag. 60. Folio. Londini, 1686.

† De Renibus, Cap. III. p. 92.

‡ Arteriarum rami dant vicissim ramulos laterales, capillares, brevissimos, magis minus copiosos, quibus tanquam *pedicellis* appenduntur grana, cuique unum, seminum papaveris similia, nunc materie turgida. Totus ramus cum suis pedunculis et moleculis subrotundis lustratus, refert fere ribium racemum. En famosas glandulas MALPIGHII, earumque acinos. D. Alex. Schumlansky De Structura Renum Tractatus Physiologico-Anatomicus. Edente G. C. Wurtz, M. D., &c. Cum II. Tabuli Æneis. Argentorati, 1788. 8vo. § xxix. p. 77.

decidedly for their being winding and contorted vessels. Schum-lansky long afterwards calls them *glandulae auctorum*, and while he in one passage represents the clustering terminations of the arterial capillaries as the glandules of Malpighi, in another he distinguishes these glandules from the *glomeres* and *glomeruli*, or vascular balls of Ruysch. This anatomist, after injecting kidneys, and examining them, concludes that, though the appearances favour at once the doctrine of Malpighi and that of Ruysch, there are, amidst the blood-vessels of the cortical portion of the kidney, granules or globular, polyhedral or polymorphous bodies, which may be injected from the arteries; yet he doubts whether these are hollow like follicles. He allows that they are connected by cellular tissue; and he says further, that they are the terminations of the serpentine uriniferous ducts.\*

According to Müller, the Malpighian bodies are *vesiculae*, or spherical, or spheroidal bladders, which contain glomeruli or globular clusters of minute blood-vessels, and which may be extracted or removed from the vesicular coverings. He thinks also, that another matter besides these blood-vessels is contained in the *vesiculae*, and that this adheres at one point only. When these *glomeruli* or spherical balls of capillaries are extracted, there are left smooth hollow hemispheres, through the wall of which blood-vessels adjacent appear. This *vesicula* forms the capsule of the Malpighian bodies.

The diameter of a Malpighian body, at an average, is about  $\frac{7}{1000}$  of one Paris inch. The blood-vessels vary in diameter from  $\frac{1}{10000}$  to  $\frac{68}{10000}$  of one Paris inch. Consequently, the former are from thirteen to eighteen times larger than the latter.

Huschke allows that the Malpighian bodies are filled from the arteries, and are attached to these vessels; in short, that they are, as Ruysch maintained, glomeruli of blood-vessels.

Upon the whole, the Malpighian bodies may be described as globular or ovoidal vesicles, situate amidst or appended to the minute capillary divisions of the arteries, which are curled round them as tendrils of the vine or hop-plant. When the kidney is macerated in water, the Malpighian bodies may also be separately distinguished, lying in all directions between the serpentine uriniferous ducts. There they resemble vesicles according to Müller; and, while they are attached to the arteries, there is no communication between them and the urinary duct.†

The accuracy of this last statement is partly controverted by Mr Bowman, who has examined these bodies with much care.

\* D. Alex. Schumlanaky, &c. § xxxvii. xxxix. xl. et xliii.

† De Glandularum Secernentium Structura Penitiori. Commentatio Anatomica. Scripsit Joannes Mueller. Lipsiae, 1830. Folio.

He found them to be a rounded mass of minute vessels invested by a cyst of similar appearance to the basement membrane of the tubes. He ascertained also that the investing capsule is the basement membrane of the uriniferous tubes expanded over the tuft of blood-vessels.

It appears further that the terminal twigs of the artery correspond in number with the Malpighian bodies. Arrived at them, the twig perforates the capsule, and dilating suddenly breaks up into two, three, four, or even eight branches, which diverge in all directions like petals from the stalk of a flower, and usually run, in a more or less tortuous manner, subdividing again once or twice as they advance, over the surface of the ball, they are about to form. The vessels resulting from these subdivisions are very small, and consist of one simple, homogeneous, transparent membrane. They plunge into its interior at different points, and after further convolutions reunite in one single small vessel, varying in size, being generally smaller, but in some situations larger, than the terminal twig of the artery. This vessel emerges between two of the primary divisions of the terminal twig of the artery, perforating the capsule close to that vessel, and, like it, adhering to this membrane in its transition. It then enters the capillary plexus which surrounds the tortuous uriniferous tubes.

The tuft of vessels thus formed is a compact ball, the parts of which are held together by their mutual interlacement; there being no other tissue, according to Mr Bowman, forming the capsule except blood-vessels. It is lobulated, at least in certain animals, as man and the horse.

The basement membrane of the uriniferous tube, expanded over the Malpighian body so as to form its capsule, is a simple, homogeneous, and perfectly transparent membrane, in which no structure can be recognized. It is perforated, as before stated, by the afferent and efferent vessels, and not reflected over them. They are united to it at the point of transit. Opposite to this point is the orifice of the tube, the cavity of which is continuous with that of the capsule, generally by a contracted neck. This continuity Mr Bowman observed in mammalia, birds, reptiles, and fishes. When a thin section of a Malpighian body parallel to the neck of the tube is made, the capsule is observed to pass off into the basement membrane of the tube, as the body of a Florence flask into its neck. The basement membrane of the tube is lined by a nucleated epithelium of fine-granular opaque aspect; while the neck of the tube and its orifice are abruptly covered with a layer of cells much more transparent, and clothed with vibratile *cilia*. Within the capsule these cilia cease; and the epithelium beyond is very delicate and translucent. The cavity existing in the natural state between the epithelium and the tuft, is

filled with fluid in which the vessels are bathed, and which is continually impelled onwards by the movement of the cilia.

The tubules on quitting the Malpighian bodies become greatly contorted ; and this, Mr Bowman infers, is their constant disposition. The tortuous tubes unite again and again in twos, and in their course centrad become straight, forming the pyramids of Ferrein, and the medullary cones of Malpighi. Among these convolutions the Malpighian bodies are imbedded, and are in contact on all sides with the surrounding tubes.

The blood leaving the Malpighian bodies is conveyed by their efferent vessels to the capillary plexus surrounding the uriniferous tubes. The vessels of this plexus lie in the interstices of the tubes, anastomosing everywhere freely, and forming one continuous network lying outside the tubes, in contact with the basement membrane. This capillary plexus is interposed between the efferent vessels of the Malpighian bodies and the veins.

The efferent vessels of the Malpighian bodies never inosculate with each other, each being an isolated channel between its Malpighian tuft and the plexus surrounding the tubes. They are formed by the union of the capillary vessels of the tuft, and, after a course variable in length, they open into the plexus. They vary in size. In general they are smaller than the terminal twig of the artery, and scarce larger than the vessels of the plexus into which they empty their contents. They are larger in large Malpighian tufts.

From the plexus now mentioned, the veins arise and form the set of venous plexus, situate in the nipple-shaped extremities of the cones, round the orifices of the tubes, and pursuing a retrograde course to empty their contents into veins situate at the base of the cones. Another set of venous radiculæ are dispersed through the cortical part of the kidney, and each receives blood on all sides from the plexus surrounding the convoluted tubes.

From the account now given of the arrangement of the vessels connected with the Malpighian bodies, Mr Bowman infers that in the kidney there are *two perfectly distinct systems of capillary vessels*, through both of which the blood in its course from the arteries into the veins passes. The first is that system of vessels proceeding immediately from the arteries, and inserted into the dilated extremities of the uriniferous tubes, (the Malpighian bodies,) the Malpighian capillary system ; the second that enveloping the convolutions of the tubes, and communicating directly with the veins. The efferent vessels of the Malpighian bodies, which convey the blood between these two systems, Mr Bowman regards as performing to the kidney the same function which the portal veins perform to the liver, and these he accordingly regards as collected in the *portal system* of the kidney.

The only difference is the absence of one general single portal trunk.

In order to elucidate more clearly this connection of the tubules with the Malpighian bodies, and especially the circulation in the latter, Mr Bowman gives the following description of the arrangement in the kidneys of the *Boa constrictor*.

"The kidney of the *Boa*, being composed of isolated lobes, of a compressed reniform shape, displays all the points of its structure in peculiar simplicity and beauty. At what may termed the hilus of each lobe, the branches of the vena porta and duct separate from those of the renal artery and emulgent vein; the two former spreading side by side, in a fan-like form, over the opposite surfaces of the lobe, while the two latter enter its substance, and radiate together in a plane midway between these surfaces. The lobe is made up of the ramifications of these four sets of vessels, in the following mode. Each *duct*, as it runs over the surface, sends down a series of branches which penetrate in a pretty direct manner towards the central plane. Arrived there, they curl back, and take a more or less retrograde course towards the surface, and finally, becoming more convoluted, terminate in the Malpighian bodies, which are all situated in a layer at some distance within the lobe, parallel to the central plane and nearer to it than to the surface. The ducts never anastomose. The *artery* subdivides into extremely minute twigs, no larger than capillaries, which diverge on either hand, and enter the Malpighian bodies. The efferent vessels are of the same size as the afferent, and on emerging, take a direct course to the surface of the lobe, and join the branches of the vena porta there spread out. The branches of the *portal vein* on the surface, send inwards a very numerous series of twigs of nearly uniform capacity, and only a little larger than the vessels of the *capillary plexus*, in which they almost immediately terminate. This is the plexus surrounding the uriniferous tubes. It extends from the surface to the central plane of the lobe, and there ends in the branches of the *emulgent vein*.

"Thus the efferent vessels of the Malpighian bodies are radicles of the portal vein, and, through the portal vein, empty themselves, as in the higher tribes, into the plexus surrounding the uriniferous tubes. The only real difference between this form of kidney and that of mammalia, is, that there is here a vessel bringing blood that has already passed through the capillaries of distant parts, to be added to that coming from the Malpighian bodies, and to circulate, with it, through the plexus surrounding the tubes. The efferent vessels of the Malpighian bodies run up to the surface in order to throw their blood through the whole extent of the capillary plexus; which they would fail to do, if they entered it in any other part."—Phil. Trans. Pp. 64, 65.

In short, Mr Bowman thinks that he has established the following facts.

1st, That each Malpighian body consists of the dilated extre-



mity of a uriniferous tube, with a small mass of blood-vessels inserted into it.

2d, That the Malpighian bodies may be easily injected from the arteries, and that the capillaries surrounding the uriniferous tubes may be injected though less easily. When the tubes are injected, it is by extravasation from the Malpighian tufts.

3d, By the veins, the capillaries surrounding the tubes may be injected; but neither the Malpighian bodies, nor the arteries, nor, without extravasation, the tubes. The main cause of this impediment to injection and the movement of fluids from the veins into the arteries is the position and small size of the efferent vessels of the Malpighian bodies, which stand in the way of any fluids being transmitted to the Malpighian vessels.

4th, The Malpighian bodies cannot be injected from the tubes, neither can the plexus surrounding the tubes or the veins be injected without extravasation.

5th, There is only one Malpighian body to each serpentine tube.

6th, The epithelium of the tube, when it enters the expanded portion which forms the Malpighian body, becomes transparent, and is covered with vibrating cilia.\* Within the capsule, however, of the Malpighian body the cilia cease.

The accuracy of several of the representations of Mr Bowman has been doubted, and more or less decidedly controverted by Huschke, Reichert, Gerlach, and Bidder. Reichert states, that whatever means be adopted, by making minute sections of recent kidneys, and using high magnifying powers, he never was able to observe any transition of the uriniferous ducts into the capsule of the Malpighian bodies.†

On the other hand, some confirmation of the correctness of this part of Mr Bowman's representation is furnished by the structure of the kidney in the Myxinoid fishes by Muller. In these animals, which present the simplest type of renal structure, this connection is undoubted.

Gerlach made trials of the same kind as those by Reichert, yet without tracing any connection between the uriniferous tubes and the capsule. He further denies that the uriniferous ducts terminate in shut ends in the capsule. These ducts or tubules form collars, and what has been taken for shut ends of ducts, are nothing but the capsules, which communicate with the same by means of a short neck, which is evidently thinner than the urini-

\* On the Structure and Use of the Malpighian Bodies of the Kidney, with Observations on the Circulation through that Gland. By W. Bowman, F. R. S., &c. Read February 17, 1842. Philosophical Transactions of the Royal Society of London for 1842. London, 1843. Part i. p. 57.

† Bericht über die Fortschritte der Microscopischen Anatomie in dem Jahre 1842. Von Reichert, Prof. in Dorpat. in Muller's Archiv, Jahrgang 1843.

ferous duct. The capsule is not a blind termination of a uriniferous duct, but a retraction or introversion,—a *diverticulum* of the same structureless membrane which forms the uriniferous tubes.

Gerlach admits that the account given by Mr Bowman of the perforation of the capsule by the arteries is correct.

As to the point at which the capsule is perforated by the afferent and efferent vessels, Gerlach thinks that the statement of Mr Bowman is too exclusive, when he represents this point to be always opposite to the opening of the uriniferous tube into the capsule. He gives a figure, (fig. 12,) which shows that the point, at which the afferent and efferent vessels perforate the capsule does not always correspond to the point of communication between the uriniferous ducts and the capsule.

The point in Mr Bowman's statements, which has been most strongly controverted both by Reichert and Huschke, is that as to the free entrance of the Malpighian capillary network into the cavity of the capsule; and both justly remark that such an assumption is at variance with all experience hitherto collected on the laws of histological organization; there being no example yet known of vessels lying immediately in the cavity of a secreting tissue. In truth, the representation of Mr Bowman, that the water of the urine is separated from the blood flowing in the Malpighian capillary vessels by simple transudation alone, while the peculiar constituents of the urine are separated through cells at the inner surface of the uriniferous ducts, Gerlach regards as in every respect a rash statement, and to be corroborated by no other fact. On the other hand, all investigations on glands prove, that in the process of secretion, cells are the essential element; and in the present state of science, it is impossible to think of secretion without cells.

He further adds, that when the Malpighian capillary network is closely examined, after the capsule has been entirely detached from it, we see it in its whole extent covered by a thick layer of nucleated cells, which are continued from the inner wall of the capsule upon the Malpighian vessels; and the latter lies introverted within a layer of cells, like the intestine within the peritonæum. The Malpighian capillary network further possesses the essential element of secretion, in which the blood undergoes those chemical changes which the metabolic force of the gland-cells imparts to the secreted product. The secretion in the Malpighian vessels differs from the usual secretions, only in so far as between vessels and secreting cells there is no structureless membrane; which last, however, appears not to be an essential condition to the process of secretion.

On the existence of ciliary motions at the point of transition of the uriniferous tubes to the capsule, evidence is contradictory.

Huschke and Reichert could observe no ciliary motion in the places indicated by Mr Bowman; and the latter denies even any layer of cells at the inner surface of the capsule. On the other hand, Bischoff is convinced of the presence of *cilia* in the kidneys of the frog. Valentin observed ciliary motions not only in the spots indicated by Mr Bowman, but even within the capsule; and Pappenheim gave a verbal communication on the same fact. The result of the inquiries of Gerlach is as follows. In mammalia he could never, unless he examined perfectly recent kidneys, observe ciliary motions either at the *cervix* or in the capsule. On the other hand, he found the inner wall of the capsule lined with a very slender layer of cells, which is seen very distinctly at the edge of the capsule. Between these cells lining the inner wall of the capsule and those which cover the Malpighian network, normally there is found a small interval.

In examining the recent kidneys of the frog, on the other hand, Gerlach convinced himself of the presence of ciliary motions not only in the *cervix* or collar, but also in the whole inner surface of the capsule; and he thinks it probable that ciliary motion is a phenomenon not peculiar to the renal capsule of the frog, but generally diffused over the animal kingdom.\*

The results obtained by Bidder are not less at variance with those given by Mr Bowman.

Bidder states, first, that in no circumstances, and by no means which he could devise, could he obtain any certain evidence of connection of the *glomeruli* with the uriniferous ducts. The vascular bundles were always found below and between the uriniferous ducts, without interior relation to themselves, either uncovered or surrounded by the capsule seen by Muller. Never is there seen on the *glomerulus* an unequivocal trace of an appended canal, and never at the inner surface of the capsule, or any where else in the uriniferous ducts, ciliary epithelium. From these facts Bidder thinks it results, that the representations by Mr Bowman contain one fact which is incorrect. This is, that as stated by Gerlach, the circumstance of vessels being exposed uncovered is quite at variance with all hitherto known as to the laws of organization. He finds, however, from examining the kidneys of the water salamander, that while the representation of phenomena, as seen by Mr Bowman, is essentially correct, the explanation of these phenomena requires in many parts to be rectified.

For the investigation in question, the anterior part of the kidney of the male triton, (*Triton tæniatus*,) is particularly well adapted, because it is by nature expanded in such manner, that for mi-

\* Beiträge zur Strukturlehre der Niere von Dr Joseph Gerlach, prakt. Aerzte in Mainz. Archiv für Anatomie, Physiologie, und Wissenschaftliche Medicin, von Dr Johannes Muller. 1845, No. IV. Seite 378.

microscopical examination no further artificial preparation is required. Indeed, if one of the leaf-like masses of serpentine canals, of which the part of the kidney specified consists, is simply cut out and placed under the microscope, this is all that is requisite in order to exhibit completely, without exception, the whole of the texture under consideration. Bidder further found that any attempt to improve such a preparation by artificial means, as pulling and tearing with needles, to expand fully the convoluted ducts, usually obliterates the characteristic texture, removes the connection of the *glomeruli* with the uriniferous ducts, destroys the flask-like dilated terminations of the latter, removes the aspect of ciliary epithelium, and otherwise renders the part unfit for examination, so as to give correct results.

In the fact now stated lies the explanation of the negative results always obtained from examining the kidneys of the frog, because the microscope cannot be employed until fine sections of the renal substance have been spread out by mechanical means. He allows, also, that as these parts are not so easily found in the frog, it is no small proof of the perseverance of Mr Bowman, and the solidity of his inquiries, that notwithstanding these unfavourable circumstances in the higher animals, he has been able correctly to give the essential circumstances of the renal structure. In the serpent family and in lizards, the connection of the *glomeruli* with the uriniferous tubes is seen with comparative ease. But never in the higher animals did Bidder find, notwithstanding numerous trials, any fact which could suggest or establish the direct connection of these parts of the kidneys.

In the triton, on the other hand, there are observed in the parts of the kidney specified, at pretty regular distances from each other, shut terminations of the uriniferous tubes, which become dilated in the flask-like shape, and make themselves distinguished from the cylindrical tubes by greater transparency. Before the transition into these dilated parts, the uriniferous tube appears to be sometimes contracted; yet this is by no means uniform. Normally only one uriniferous tube passes into this sort of dilated portion; sometimes, however, two uriniferous tubes are connected with the same dilated portion, by which the objection of an illusion taking place thereby is completely set aside, viz. that by pressure the contents of one canal may be forced, without impediment, through the dilated portion into the second canal, and impelled onwards in it. In such circumstances also, the designation may be, instead of a closed termination of the uriniferous tube, rather a general dilatation in the course of such a tube.

Of the presence of an *epithelium* with actively vibrating *cilia*, immediately before the transition of the uriniferous tube into the flask-shaped expansion, and in the *cervix* or collar of the latter, as

also in a considerable space of the inner wall of the same, Bidder states that he has completely convinced himself. The representation of Mr Bowman, that the vibratory epithelium layer of the uriniferous canals is prolonged into the expanded portion, progressively diminishing in thickness, he finds to be quite correct; but he observes, that not in every instance can we expect, even in the triton, to be able to recognise this circumstance with the desired certainty. He had inspected many preparations before he was able for the first time to be satisfied of the accuracy of the observation of Mr Bowman. The third part, or even the half of the circumference of the flask-shaped expansion presents this ciliated epithelium. If the same appears sometimes to be still more expanded, this depends only on the circumstance, that higher up detached ciliated cells are thrust deeper into the cavity.

On the other hand, the statement which Mr Bowman makes in denying any epithelium to the rest of the walls of the cavity, Bidder finds to be inaccurate. He finds here a simple thin plate-formed epithelium, which appears in pretty regular polygonal forms; and if this do not appear equally evident in every case, the deficiency appears to depend on this circumstance, that from the contiguous uriniferous tubes entire epithelium cells or their fragments are thrust by the pressure of the covering glass plates into the cavity, and the correct view in the same is destroyed. The original transparency of these cells is frequently lost before the eyes of the observer; and there is thus sufficient opportunity to observe immediately the cause here specified.

Opposite the entrance-spot of the uriniferous tube into that expansion, or on one side of the latter when it is connected with two tubes, the Malpighian vascular tuft enters the uriniferous tube, and advances to a greater or less depth in the expanded portion itself; so that sometimes it fills the half of the cavity, sometimes it occupies a much smaller part of it. As to the statement that the *glomerulus* perforates the wall of the uriniferous tube, lies uncovered and free in this cavity, and is immersed in the fluid of the same, it must be indeed admitted, that the microscopical image on superficial examination appears frequently to agree with this; but that this is nothing but an illusive appearance any one, by more careful examination of all the circumstances taking place, may be convinced in the most positive manner. For, when the preparation has not lost its original translucency by the causes mentioned, it is at once easy to observe, sometimes directly, a partition separating the cavity of the expanded uriniferous tube from the vascular bundle. This partition appears like a fine arch-shaped border denoted by one single line, the convexity of which is directed towards the cavity, and the concavity towards the vascular bundle, which is usually most difficult to be distinguished

on the most prominent points of the vascular network, and is most manifest in the distributions on the delicate interstices of the same, the periphery of which is in uninterrupted connection with the proper tunic or basement membrane of the uriniferous tubes. But even if this partition did not present itself to the eye with the desired distinctness, which from its delicacy cannot be wonderful, several convincing circumstances indicate its presence.

1st, The already mentioned entrance of the epithelial fragments in the expanded portions; for, while the latter thereby lose their translucency, that of the Malpighian bodies is little or not at all impaired, and remain clear and transparent, while the residual blood globules or their *nuclei* are from the first not in any way diminished in transparency.

2d, The phenomena of compression of the preparation prove the existence of such a partition. The fluid granular content of the expanded portions is thus impelled hither and thither without any entrance of the same ever being effected between network of the vascular bundle, and any mutual yielding of the last; and by such pressure the *glomerulus* itself, yet always only in one mass, and not in individual vascular clusters. This proves unequivocally the presence of a medium, by which the network of the vascular mass is held together; and that this connecting bond must be a membrane enclosing the whole vascular bundle, and cannot be a cement holding one of the separate networks to another, is shown by this circumstance, that after drawing the *glomerulus* from the uriniferous tubes, the vascular convolutions drop from each other, and present at the circumference of the mass disproportionately larger furrows than in the natural disposition of these parts.

Lastly, by continued pressure the *glomerulus* is forced back from the uriniferous tubes, nay, may be expelled from them entirely; and in such circumstances it may be again evidently perceived, that the whole flask-shaped expansion is surrounded by one uninterrupted outline, on the outside of which the *glomerulus* is placed.

Assuredly the uncovered disposition of the *glomerulus* in the cavity of the uriniferous tube would be contradicted, were it possible to prove that the plate-formed *epithelium*, which, as observed, covers part of the cavity, covers also the vascular mass. Though he allows that he cannot prove this unequivocally, yet he maintains that the rectification here suggested is probable. This he does in the following manner.

The relation of the *glomerulus* to the expanded portion of the uriniferous canal appears to him most properly to be referable to the series of those formations which it is usual to designate as *introversions*; by which nothing is stated as to their origin, but

merely a certain form and kind of position of organic structures within each other is meant. In the case here treated, of such introversions, the same appears to take place at the thinnest and feeblest point of the wall of the shut end of the uriniferous tube. This is proved by the fact, that when, in consequence of strong pressure, the expanded portion bursts, this bursting regularly happens at the point where the proper tunic (basement membrane) of the uriniferous duct coalesces with the *glomerulus*. The outline of the partition mentioned appears also unequally feebler than at the other points of the circumference of the expanded portion. But this circumstance undoubtedly has great influence, that the ligamentous substance which lies on the outside of the uriniferous tubes and strengthens their walls, passes in uninterrupted succession, usually upon the vessels going to the *glomerulus*, but never enters the *glomerulus* itself; so that the vascular network of the same is actually held together only by the enclosing slender proper tunic of the uriniferous ducts.

In Mr Bowman's representation of the renal texture, a misconception has accordingly happened by this, that the capsule of the *glomerulus* and the expanded portion of the uriniferous duct are fully identified, while both are to be easily distinguished, though, as belonging to one and the same organic part, they pass insensibly into each other. In the agreement in the anatomical basement of the *tunica propria* of the uriniferous ducts and the capsule of the *glomerulus*, it is intelligible, that if the *glomerulus* and uriniferous ducts are separate from each other, in the first no trace of the early connection may be found, while the only available means of showing this connection, viz. the positive relation of both, are removed. So it is intelligible, how the *glomerulus*, after artificial spreading out sections of kidney and detachment from the uriniferous ducts, sometimes lies free, sometimes appears surrounded by a capsule. Because this capsule is not the covering belonging originally to the *glomerulus*, but only touches at the neighbouring connecting tissue, which, after separating the *glomerulus* from the uriniferous ducts, sometimes surrounds the same. Hence proceeds the statement made under these circumstances, that the *glomerulus* lies free within its capsule. Indeed there is here between the vascular packet, the network of which is more expanded, and the connecting tissue accidentally lying on the same, a free space; while the natural capsule of the *glomerulus*, that is, the introverted part of the uriniferous duct, lies close to the same.

The term capsule of the *glomerulus* has also been applied, on the one hand, to the flask-shaped dilated uriniferous duct itself, because it is supposed that the *glomerulus* lies free in the same; and, on the other hand, the connecting substance surrounding the *glomerulus* after preparation of sections of renal tissue might be

viewed as the natural capsule; in both cases the true capsule would be misunderstood.\*

Lastly, A. Kölliker of Zurich maintains with Mr Bowman not only the connection of the renal ducts with the capsule of the Malpighian bodies, but also at the entrance of the capsule and the contiguous portions of the renal ducts, or in the neck and orifice of the uriniferous tube, the existence of a ciliated epithelium with vigorously acting *cilia*.

According to this observer, whose observations were made on the kidneys of the embryo lizard, uriniferous ducts, measuring from  $\frac{1}{80}$  to  $\frac{1}{100}$  in diameter, consist of two layers. The outer is formed of a slender structureless membrane, which is easily distinguished by the addition of water, and is altogether a repetition of the outer coat of the renal ducts. The inner is a stratified epithelium, from  $\frac{1}{1000}$  to  $\frac{1}{2000}$  parts of one inch thick. The cells of which it consists are roundish, flat,  $\frac{1}{2000}$  of one inch thick,  $\frac{1}{800}$  broad, with *nuclei* in two, three, or more layers arranged over each other. The inner layer is remarkable for distinctly developed ciliary processes, from  $\frac{1}{1000}$  to  $\frac{1}{800}$  of one inch long, which, by their vigorous action, attract the attention of the most superficial observer, and furnish an interesting sight in transverse sections of the canal. The ciliated epithelium, so far as Kölliker saw, covers the whole length of the canal: but it is wanting in the common excretory duct of the gland, and in the ends of the canals. These are the Malpighian bodies, the existence of which, in the primordial renal matter, has been established by Rathke's observations on the development of the viper. Every Malpighian body which has a diameter of from  $\frac{1}{80}$  to  $\frac{1}{100}$  of one inch, is a bladder or *vesicula*, which is placed immediately at the end of the renal duct, and is in free communication with the same. The structureless membrane of the ducts is peculiar to it; so also is the epithelium, only more slender, and is formed of one single layer, and is void of *cilia*. Within the Malpighian body is a cluster of capillary vessels, which enter and emerge at the origin of opposite sides of the canal, and, as it appears, are separated from the cavity of the renal duct or tubule by a layer of cells.†

M. Kölliker further thinks that it may be owing to the mode of preparing the parts, that Reichert and Bidder did not observe the ciliary motions. If these parts are copiously sprinkled with water, the nucleated cells swell so much, that it is impossible to distinguish the nucleus and contents; and they appear only as

\* Ueber die Malpighischen Körper der Niere; von F. BIDDER in Dorpat. Archiv für Anatomie, Physiologie, und Wissenschaftlichen Medicin. Von Dr Johannes Müller. 1845. Heft V. Seite 508.

† It does not very clearly appear, from this mode of expression, whether M. Kölliker describes this partition from his own observation or from that of Bidder, by whom it has been shown, this partition was discovered.



pale, apparently homogeneous transparent globules. This renders the ciliary movements indistinct, or annihilates them. But, at all events, M. Kölliker has more frequently seen them in preparations moistened with serum, albumen, or frogs' urine than in those sprinkled with water; and he has found them most certainly in preparations entirely unmoistened.

In one point only he thinks Mr Bowman's statements not quite correct, viz. regarding the epithelium of the Malpighian bodies. He observed within the capsule a complete epithelium; but the *cilia* he traced no further than the entrance of the capsule. He has satisfied himself, by preparations made with the greatest care, that within the capsule of the Malpighian bodies there is normally no free cavity.\*

Such is an abstract of the present state of information on the microscopical anatomy of the kidney and the Malpighian bodies. It will be seen, that, notwithstanding the skill and dexterity of the observers, the facts are contradictory and not easily reconciled. We have nevertheless given them for various reasons; *first*, to show the great difficulty of the subject; *secondly*, to prove what is admitted by Henle, that microscopical anatomy is still in a transitional and imperfect state; and also, *thirdly*, to enable readers to form some idea of the minute structure of the glands. Though the kidney is in some respects peculiar in its minute structure, yet it agrees with other glandular organs in certain general and leading characters; and the exposition of these, however incomplete, may serve to communicate an idea of the peculiar characters of glandular structure in general.

Before quitting the subject, however, it is proper to observe that one, if not two of the points on which Reichert, Gerlach, and Bidder differ from Mr Bowman, depend on optical illusions only; that he has described correctly what he saw by the microscope; but that, from some cause not easily understood, he has not given the explanations of the phenomena which they conceive to be correct.

On the uses of the Malpighian bodies we have no positive correct information. All is supposition and conjecture; and those who have most studied these bodies, have been least willing to speak with confidence. The fact that they are placed among the serpentine renal ducts, and that they are furnished with a peculiar arrangement of capillary arteries, may favour the inference that they are in some way connected with the secretion of urine. If the fact contended for by Mr Bowman, that the Malpighian bodies are connected with the serpentine ducts, were established,

\* Ueber Flimmerbewegungen in den Primordial Nieren; von A. Kölliker, Archiv für Anatomie, Physiologie, und Wissenschaftliche Medicin. Heft V. S. 518. 1845.

this inference would be rendered almost certain. This communication, however, is denied by Müller and others; and Müller accordingly maintains, that the Malpighian bodies have no concern in the secretion of urine.

Mr Bowman, on the other hand, who thinks he has shown, that each Malpighian body is situate at the remote or superior extremity of a uriniferous tube, and that the tufts of vessels are a distinct system of capillaries inserted into the interior of the tube, infers that, as the arrangement of the vessels in the Malpighian tufts is evidently designed to retard the motion of blood through them, the insertion of the tuft in the extremity of the tube indicates that this retardation is connected with the secreting process. He concludes, therefore, that it is highly probable that the use of the Malpighian tufts is to affuse water abundantly and uniformly over the urine, as it is secreted, so as to ensure the perfect solution of all its constituents. Along with this, he thinks that these bodies, by contributing to remove aqueous matter from the blood, act as a self-adjusting valve or sluice to the circulation. The use of the Malpighian bodies, in short, according to Mr Bowman, is to separate from the blood the watery portion, according to the necessities of the system.

We have only to add, in order to complete the description of the renal serpentine ducts, that while they advance through the cortical portion of the kidney to its periphery, they are not always, properly speaking, serpentine.

In the horse, for instance, in which they are so large that they may be perceived by the eye, at least after injection, without the microscope, they do not run in the serpentine and tortuous course, which they observe in man and most other animals. They are continued from the straight ducts, very slightly bending or undulating, but still almost straight, for at least one inch or one inch and a-half. As they approach the surface of the cortical portion, these undulating flexures increase, and at the very surface they are completely converted into serpentine or tortuous tubes.

In the squirrel also, the serpentine ducts are large, and united by little cellular tissue. In that animal they are seen without injection, by the microscope. The Bellinian ducts advance straight through the medullary cones, and then passing into the cortical matter, become bent. They appear a little larger than the medullary ducts upon entering the cortical portion.

The most recent inquirer into the structure of the kidneys is Mr Toynbee, who has evidently studied with much care the disposition and the termination of the tubuli, and the arrangement of the blood-vessels in the *corpora Malpighiana*. His descriptions are very accurate; but they differ not materially from what has been already stated on this head. The following summary of the relation of the *tubuli* to the Malpighian bodies is given.

" 1st. The capsule of the corpus Malpighianum, instead of being, as supposed, an expansion of the tubule, is a distinct globular investment, enveloping both the tubule and the tuft of vessels.

" 2nd. This globular investment is neither continuous with the tubule, nor with the blood-vessels, but is expanded over them.

" 3rd. Into one part of the capsule the artery enters, while the other receives the tubule.

" 4th. The artery divides and subdivides, so as to form a globular mass of capillaries in the interior of the capsule from which the efferent vessel emerges.

" 5th. The tubule, after penetrating the capsule, becomes tortuous, and twists into a coil, and after being in contact with the ramifications of the corpus, it emerges from the capsule."

Mr Toynbee gives the following view of the mode in which the arteries of the kidney terminate, of their relation to the Malpighian bodies, and of the peculiar structure of these bodies.

" The principal mode of termination of the renal arteries is in the corpora Malpighiana, although I am not prepared to deny that *some* of the branches may form a capillary network without entering the corpus. The structure and relations of the corpora Malpighiana are deserving of the most attentive consideration.

" *The corpora Malpighiana.*—From the time of their discovery to the present day, these bodies appear to have been objects of careful examination to various anatomists, among whom, notwithstanding, serious difference of opinion prevailed as to their structure and functions. Those modern investigators, however, who have submitted successful injections of the corpora Malpighiana to inspection by the microscope, seem to agree that they consist of plexuses formed by ramifications from the arterial branches. Müller, who is of this opinion, describes them as lying 'in vesicular cavities of the cellular tissue between the tubuli uriniferi.' Huschke also after delineating the Malpighian body in the kidney of the salamander, characterizes it as made up of the convolutions of a single blood-vessel. Berres has contributed very beautiful drawings of the injected corpuscles in the human subject, and demonstrated that they consist of the divisions and subdivisions of a small artery, that their form is usually circular, and that small vessels are given off from their circumference.

" The corpora Malpighiana are only to be found in the cortical portion of the kidney, where, though they may seem at first view to be promiscuously distributed to all parts alike, yet a closer inspection will discover that they are ranged more or less in rows radiating from the centre towards the surface of the organ, which rows correspond with the interspaces of the columns of tubuli in the central part.

" *Of the structure of the corpora Malpighiana.*—These bodies are composed of two distinct elements,—a plexus of blood-vessels and a membranous capsule, which completely surrounds and envelopes the plexus. Some of the most marked and frequently-occurring features of the disease treated of in the second part of these researches, will be found to arise from a morbid condition of these two elements of the corpora.

“ *Of the capsules.*—If a section be made of a healthy uninjected kidney, the naked eye is able to detect the presence, over the whole surface, of numerous globular vesicles, whose colour is a shade deeper than the surrounding parts. Several of these vesicles will be found to have been partially dislodged, from the substance of the organ, in making the section, and to project from its surface, while corresponding cavities will indicate where others have been dislodged during the same operation. The round bodies when viewed through the microscope, are discovered to consist of a thin transparent membrane enclosing convolutions of blood-vessels. This membrane is disposed in a spherical arrangement, and gives to the corpus Malpighianum its globular form. These bodies become flattened by a gentle compression, but resume their spheroidal figure as soon as the pressure is removed. The membrane just mentioned may be appropriately termed the capsule of the corpus Malpighianum. It is thin and transparent, nor can the microscope detect in it either fibres or cells. To its internal surface numerous fine granules are attached, and from one part of its circumference there frequently extends a funnel-shaped prolongation, which is in fact the point from whence the uriniferous tubule emerges. The mode of connection between the two has been already treated of. By lacerating this capsule it can be readily separated from the vessels it contains, which are attached to its surface only at one point, being elsewhere surrounded by a small quantity of fluid. The external surface of the capsule itself is also but slightly attached to the parenchyma of the organ, from which it may be detached with the greatest ease.

“ The contents of the capsule consist of convolutions of vessels closely aggregated together, and apparently attached to a central vessel from which they radiate. Towards their circumference the convolutions present dilatations, the greater number of which do not appear to be continuous with any other vessels. The exact mode in which the blood-vessels of the Malpighian body are disposed, can only be thoroughly understood by a careful examination of properly-prepared specimens. It will be seen that the small artery of the corpus has various modes of distribution. In some instances, immediately on entering the capsule it divides into two or three branches, these again subdivide and form the convoluted plexus, which plexus having been again collected into a single trunk, issues from the capsule close to the point at which the artery entered it, and then divides once more to form the capillaries of the organ. From the minuteness of the healthy corpus, it is impossible from that to ascertain with precision the manner in which the emerging vessel of the corpus takes its rise from the rete; but from an examination of the Malpighian bodies when morbidly enlarged, it would appear that it springs from the convoluted vessels by radicles of much smaller dimension than the convolutions themselves. In some instances the *rete* seems formed by a single branch of a single vessel in which the artery terminates. Though as a general rule it is otherwise, I have occasionally been enabled to obtain a distinct view of the capillaries arising directly from the convolutions of the corpus. The single

trunk which emerges from the corpus sometimes unites with another proceeding from an arterial branch which is entirely unconnected with the corpora. In this case, the combined trunk immediately divides again into capillaries. There occur instances where the efferent vessel emerges from a part of the capsule distant from that at which the efferent vessel entered. The meshes of the capillaries are elongated in a direction from the centre to the surface of the organ : and it has been already noted that the Malpighian bodies are disposed in a more or less regular and lineal order, the tendency of the lines being from the tubular portion of the organ towards its surface. The spaces between these rows contain the capillary ramifications, and correspond with the columns of tubuli in the tubular division, in the like manner as the rows of corpora do with the interspaces of the columns. The arteries in the tubular region of the kidney present the peculiarity of following a straight course, and are arranged in bundles of the shape of elongated cones whose bases are continuous with the cortical portion, and their apices directed towards the mammillary processes."—Pp. 312—315.

We have next to consider shortly the applications of the facts now stated to the pathological anatomy of the kidney.

According to Dr Johnson, who has ascertained that the epithelial cells of the healthy kidney contain a minute quantity of oil in the form of yellowish highly refracting globules, the granular disease first described by Dr Bright consists *primarily and essentially in an exaggeration of the fatty matter which exists naturally in small quantities in the epithelial cells of the healthy organ*. It appears that though in every healthy kidney there are many cells entirely free from oil, while others contain only one or two minute particles, yet in others they are scattered more abundantly over the interior of the cell. These are liable to become increased in number and in size. When a granulated kidney in the advanced stage is examined by the microscope, it presents epithelial cells in every degree of engorgement and distension with oil or fat globules, from the incipient form, which is that of very minute particles, to complete distension of the cell, in which the nucleus is concealed by the fatty globules.

Dr Johnson therefore infers that Bright's disease is a fatty degeneration of the kidney, analogous to fatty degeneration of the liver.

Any one of the granulations described by Dr Bright consists of a set of gorged tubes presenting itself either on the surface of the gland, or in its substance, on the surface of a section. The deposit is contained within the tubes ; and when these are broken up, it is seen that the fatty matter is contained within the epithelial cells which line the tubes.

The accumulation of fat, however, is not the same, or to the same extent in every part of the tubes. Those portions of the tubes which form the pyramids, and which are lined by epithelium similar to that of the excretory ducts, do not become filled with

oil in any great degree, except in cases in which the disease has been of long duration, and in which the cortical part of the kidney is much wasted.

Another portion of the kidney rarely much affected, according to Dr Johnson, is that which forms the investment of the Malpighian plexus. When the tubes are completely filled, the Malpighian capsules are either entirely free from oil, or only a few particles are scattered over their interior. Yet even in extreme cases, the accumulation of fat within the capsule does not proceed to such a degree as to exert destructive pressure on the vessels of the Malpighian tufts.

Dr Johnson maintains further, that this deposit is not preceded by any inflammatory or congestive stage. Congestion accompanies the disease; and this may be active or passive; and is produced by the distension of the epithelial cells, and the consequent impairment of their secretive function; which again gives rise to the effusion of serum and blood within the tubes. All this, however, is the consequence or effect, not the cause of the deposit.

The different modes and degrees in which the fatty deposit takes place give rise to the different external appearances of the kidney. As the accumulation of fat increases the kidney becomes granular or mottled on the surface. The smooth mottled kidneys are those in which the greatest number of the tubes in the cortical portion are almost uniformly distended. The granular and atrophied or small shrunk kidneys are those in which the accumulation of fat takes place less rapidly and less uniformly. Some convoluted tubes become distended with fat, forming prominent granulations; and these compressing surrounding parts produce obliteration of vessels and atrophy of tubes; and thus the entire gland is wasted and contracted.

Dr Johnson further finds that granular disease of the kidney is often associated with fatty disease of the liver and the steatomatous degeneration of the arteries, which is also an adipose deposit. Among 22 cases of granular disease of the kidney examined in the summer of 1845, in 17 of these there was in a most marked degree fatty degeneration of the liver. In 4 of the remaining 5 cases there was a decided increase of fat in the hepatic cells; and in only one case was no increase observed. During the same period Dr J. met with only 4 cases of fatty liver in which there was no attendant disease of the kidney.

It is also associated with tuberculation of the lungs, though in a much less common degree.

From these facts the author thinks that the opinion, that Bright's disease may originate in an attack of dropsy supervening on scarlet fever must be modified; and he further thinks, that the dropsy ensuing on scarlet fever does not depend on the presence of

Bright's disease. That dropsy he regards as the result partly of cutaneous disease, partly of the effort made by the kidneys and their vessels to relieve the circulation of the skin, the secreting function of which is so much impaired.

The albuminous urine, according to Dr Johnson, is quite a secondary effect.

From experiments made on cats, it appears that confinement in dark chambers has the effect of inducing granular degeneration of the kidney, and causing the deposition of oil in the urine of these animals. Yet we are not informed that granular disease of the kidney is a very common affection among prisoners, or is more frequent among persons confined in jails, prisons, and within doors than among those living in the most perfect freedom.

These views are at variance with those entertained at present and hitherto by the great majority of pathologists. Most physicians have admitted in the early stage of granular disease of the kidney a state of congestion; and though they do not say, that the granular state is the constant effect of inflammation, yet they allow that it is often attended with inflammatory and congestive phenomena. This idea has been very well illustrated by Mr George Robinson, who has shown that by ligature of vessels and various other injuries the urine is rendered albuminous.\*

The inferences of Dr Johnson are still more decidedly opposed by Mr Toynbee, who states that there can be no doubt, that albuminous urine often exists without any deposition of fat in the tubules and their cells. As we feel that Mr Toynbee's own statements will communicate his ideas most correctly, we subjoin them.

*"The first stage of the disease.*—In this stage, the kidney is enlarged, and innumerable black points are visible, which are the corpora Malpighiana dilated, and their vessels distended with blood, seen through the capsule. The white spots, which derive their appearance from the collection of fatty matter, begin to be perceptible.

"The peculiar features of this stage consist of an enlargement of the arteries entering the corpora Malpighiana; the dilatation of the vessels of the tuft, the capillaries and the veins; an increase in the size of the capsule of the corpus and of the tubuli, and a large addition to the quantity of the parenchyma of the organ.

"The condition of the arteries is visibly changed, even at this early period; the artery entering the corpus being actually twice or thrice its natural size, which is the case also with the Malpighian tuft and the capillary vessels which spring from the tuft. An injection, in this stage, cannot very easily be made to pass through the tuft and fill the capsule of the corpus,—a circumstance which almost always attends injection in the later stages of the disease.—(Plate IX. fig. 2.)

\* Researches into the Connection existing between an unnatural degree of compression of the Blood contained in the Renal Vessels, and the presence of certain abnormal matters in the Urine. By George Robinson, Esq. Read 14th February 1843. *Medico-Chirurgical Transactions*, Vol. xxvi. p. 52. London, 1843.

"The capillaries and veins are greatly enlarged, giving to the surface of the organ the resemblance of network.—(Plate X. figs. 2 and 3.) This is the commencement of the stellated condition, which is so marked a characteristic of the next stage of the complaint.

"The tubuli in this stage are also much increased in their dimensions; but the fat which is found in them is soft and white.

"*The second stage of the disease.*—The organ in this stage is very greatly increased in size, its surface is smooth, and presents numerous white spots; the capsule is but slightly adherent to the surface, and the tissue of the organ is flabby.

"The structural changes exhibited during this stage are the following:—

"1st. The artery of the corpus Malpighianum becomes so greatly enlarged, that frequently it equals the dimensions of the tube itself, and is eight or ten times its natural size. It is tortuous and dilated, and sometimes, previous to entering the capsule of the corpus, presents analogous swellings to those of varicose veins. The primary branches of it, in forming the tuft, are also distended to ten or fifteen times their natural size, and are not unfrequently discovered external to the capsule of the corpus, as though thrust out by some internal force. The vessels forming the tuft are likewise enormously enlarged, and very often the minutest branches are fully as large as the main artery of the corpus in a healthy state.

"Occasionally the tuft is broken up, and instead of forming a compact mass, exhibits its individual branches separated from each other. At other times the branches of the tuft are actually larger than the primitive artery of the corpus.—(Plate IX. figs. 3 and 4, and Plate XI. fig. 2.) Under these circumstances it is singular that Mr Bowman should have made the following remarks:—'Though I have examined, with great care, many kidneys at this stage of the complaint, I have never seen, in any one instance, a clearly dilated condition of the Malpighian tuft of vessels.' He adds, 'On the contrary, my friend Mr Busk, an excellent observer, has specimens which undoubtedly prove these tufts not to be dilated in the present stage: and I possess injected specimens showing them at all stages, but never above their natural size.' It is very possible that the peculiar injection used by Mr Bowman may account for the fact which he mentions, and this conjecture is rendered extremely probable, as in the latter stages of the disease the Malpighian tuft becomes pressed upon by the adipose accumulation within, and, after undergoing compression, will permit the fluid used in the process of double injection to pass through rather than yield and distend. There are instances again in which the tufts are not enlarged, but appear healthy even in organs otherwise extensively diseased: but it is important to add that these tufts, both in the second and third stages, when but slightly enlarged, or even not enlarged at all, will offer free passage to the injection, on the most gentle pressure, without even distending the whole of their vessels, and thus indicate their diseased condition.

"An enlargement of the renal arteries and dilatation of their branches are also observable in this stage of the disorder.



" The capsule of the corpus, too, is in this stage very greatly increased in size, and during the process of injection becomes frequently filled with the injection thrown into the arterial system. Although thus enlarged, it does not become ovoid, but presents slight bulgings in several parts.

" The tubuli differ considerably from their healthy condition, being enlarged to two or three times their natural size, and aggregated together in masses, so as to lie in contact with each other, and form definite, roundish bodies: they are also extremely convoluted with numerous dilations; frequently they are varicose. At other times they present distinct aneurismal sacs, which bulge out from one part of the wall of the tube, to which they are attached by a small neck or pedicle. Occasionally, some of the vessels of a convolution are smaller than the others, and their size nearly natural. The tubuli in the masses are so closely packed, that the blood-vessels are evidently compressed, and rendered incapable of admitting an injection. At times a tube even at some distance from the corpus, becomes very convoluted, and knotted into a mass.

" *Parenchyma*.—In cases where the kidney is much enlarged, the parenchymatous cells will be found not merely increased in size, but adipose depositions will be visible throughout them.

" *The third stage of the disease*.—The kidneys are smaller than their natural size; hard, white granules are prominent on their surface, which is more or less lobulated; the capsule is adherent; vesicles of large size are frequently everywhere interspersed; and numbers of smaller ones stud the whole surface. On making a section the organ is found to be deprived of blood; the cortical part contracted, the blood-vessels large, and their walls thick.

" *Arteries*.—The arteries are in a more contracted condition than that described in the second stage; and the Malpighian tuft is so often changed from its natural state, that the greater part of its vessels are not capable of being injected.

" The capsule of the corpus has assumed a more contracted appearance.

" The arteries in this stage are so difficult to inject, that some anatomists have denied the possibility of the operation. The difficulty has its origin in the great pressure, which is exerted on the whole of the arterial system, by the contraction and hardening of the organ.

" *Veins*.—The veins in this stage present on the surface of the organ the well-known stellated aspect which arises from the gradual pressure exerted on the trunks, and the contraction of the organ. These changes are well delineated in the engraving.

" *Tubuli*.—The tubuli are larger than in the preceding stage, and are gathered into rounded masses which form the granules on the surface of the organ. The latter are of a white hue, and are most commonly fully distended with fatty depositions; though not unfrequently they appear like dark spots: the tubuli in that case being full of blood. A rounded appearance is generally characteristic of the granules, in each of which the component tubule forms innumerable convolutions. It is extremely difficult to inject the tubuli from the ureter; in-

deed it is very rarely that it is possible to distend them from this source ; nor is it an easy matter to fill them from the artery, though, as will be seen in the drawings, my efforts have not been without success. The tubuli are filled with oily cells, granular matter, particles of various sizes, and blood globules.

“ *Parenchyma*.—The parenchyma is hard, and is composed of elongated stellated cells, from the angles of which fine threads proceed, and communicate with each other.”—Pp. 321—324.

It is extremely difficult to decide between these conflicting statements. We confess that it seems singular, that the disease which we have so often seen as the granular degeneration of the kidney, should always depend on the infiltration of fat or oil into the epithelial cells of the renal tubules ; and we think it presents too great simplicity to be always well founded and in all cases applicable. We do not, however, pretend to controvert the statement, the correctness of which it is very difficult to ascertain. On the other hand we are willing to admit, that in a certain class and kind of instances of renal granulation and degeneration, which we think we can specify, fat is infiltrated, though not as a primary but only secondary lesion. Our idea is this, that chronic inflammation attacks the epithelial cells of the tubules and the tubules themselves, near the superior or cœcal extremities ; that this chronic inflammation causes the obliteration of a certain number of these tubules, and thereby destroys their secreting power, and faculty of withdrawing urea from the blood-vessels, whether through the medium of the Malpighian bodies or not ; that this disorder deranges the whole circulation of the vascular portion of the gland ; and that at the same time the cœcal extremities of the tubercles are enlarged or hypertrophied. Hence the enlargement and vascularity of the kidneys in the early stage of the disease. When this state, however, has proceeded for some time, the vascular part of the gland, that is the cortical portion, becomes atrophied and shrunk ; and as this takes place irregularly over the tubular portion, that is the serpentine-tubular portion ; hence the mottling and granulation of the surface and the general shrinking of the whole gland.

We should now have adverted to the views given in the treatise of Dr Peter Malmsten ; but our limits scarcely permit us to continue longer on this subject. The dissertation is very ably done, and contains much useful information in a condensed and interesting form ; and we hope soon to be able to speak more fully than our present limits will permit. It is curious to remark, that even in the kingdom of Sweden there is so much knowledge and so much love for its acquisition. Meanwhile, it is interesting to observe the large amount of accurate information acquired during the last six or seven years on the subject of the structure and morbid states of the kidney. Some of this information may require

to be modified, and some of it to be rectified. It is nevertheless important to possess it, as the groundwork of subsequent observations.

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ART. III.—*A Treatise on Diet and Regimen*. By WILLIAM HENRY ROBERTSON, M. D., Physician to the Buxton Bath Charity. Fourth edition, re-written and much enlarged. In Two Volumes. Volume I. London, 1847. Post 8vo. Pp. 355.

THE first edition of this work appeared so long back as 1835.\* The treatise was short, condensed, sensible, and perspicuous; and contained a view of dietetics in which, with close adherence to scientific principles, information on all topics relating to dietetic and hygienic management was conveyed in a popular and interesting form. Since that time the work has passed through three editions, in each of which the author has studied to introduce all those improvements which the gradual progress of science during the interval, and his own experience in a situation, where he has occasion to observe much of the effects of diet, have enabled him to do.

The present is in all respects a greatly improved form of the work. It is manifest that Dr Robertson has been at no ordinary pains in explaining the scientific principles of diet, according to the most recent and most approved chemical and physiological doctrines.

The work is now divided into two volumes, of which the present is the first; and in it, judging from its contents and information, the subject of diet appears to be completed. The volume is commenced with an introductory chapter on various points necessary to be explained before treating of the proper subject of diet. The author then explains in his second chapter the nature of the process of digestion, and considers the chemical relations of that function at length.

Dr Robertson then enters on the examination of the different articles employed as food, and explains on physiological and chemical principles their comparative digestibility, nutritious qualities, and fitness for articles of food, in different states of the system. The account both of animal and vegetable articles is correct, interesting, and comprehensive. He then takes a view of the nutritious and digestive properties of fruits, and explains the circumstances indicating and contraindicating their employment.

\* A Popular Treatise on Diet and Regimen; intended as a Text-book for the Invalid and Dyspeptic. By William Henry Robertson, M. D. London, 1835. 12mo, pp. 251.

Next come amylaceous or starchy articles, saccharine, oleaginous articles, seasonings and condiments. Then follow the liquors or vegetable infusions. Next are the fermented and distilled liquors; the uses of opium and tobacco; and those of water.

The author then considers the hours and the articles most suitable for the several meals; and enters at considerable length into the subject of dietaries, in which all readers, professional and general, will find much useful information, nowhere else to be obtained, and which it is evident the author has collected from many sources, with much labour and judgment.

As a specimen of his style, we subjoin what he calls the summing up.

"These general observations on diet may be fitly concluded by a rapid summing up of some of the opinions that have been offered. The amount of every man's food, however strong and well he may be, should be measured and regulated by the expenditure and consequent wants of his system, and by the amount of exercise, whether of mind or of body. His food should be eaten at stated and regular times; and, unless during sleep, he should never fast longer than five hours. This is more important in the early than in the later parts of the day. The breakfast should be, in most cases, the principal meal. The large proportion of the day's sustenance should be taken early in the day. All the alcoholic liquids should be avoided as much as possible:—

"Tho' I look old, yet I am strong and lusty;  
For in my youth I never did apply  
Hot and rebellious liquors in my blood,  
Nor did I with unbashful forehead woo  
The means of weakness and debility;  
Therefore my age is as a lusty winter,  
Frosty, but kindly."

AS YOU LIKE IT. *Act II. Scene 3.*

"As little liquid as may be, should be taken at the second, or mid-day meal,—probably, after all, the most nourishing meal eaten in the day, and the one which taxes most his digestive powers. The food should be eaten slowly; each mouthful being well and carefully masticated, and mixed intimately with the saliva. The dinner should be confined, as much as may be, to one or two dishes. Little or no supper should be eaten; and food should seldom be eaten within two hours of the bed-time. Thus living, a man will be fulfilling his duty to his health; adding to his chances of life, and to the probabilities of his prolonged usefulness, so far as his diet is concerned; and, so far, be taking the best means of warding off disease. If already dyspeptic, more care than these rules involve will be needful to him. The effect of every article of food upon his stomach, its comparative digestibility, and consequent wholesomeness, should be observed; his diet should be strictly confined to a single dish at every meal; and that must consist of what his stomach can digest without perceptible inconvenience,—if he

should, to secure this end, have to be forbidden the use of animal food, &c.,—and be confined to the most simple and least irritating kinds of farinaceous food. And, having reached that point in the scale of comparative digestibility, at which the food is found to agree with the stomach, the needfulness of restricting himself to that point should be impressed upon his mind, until, by such means of quiescence, and lessened irritation of the organs of assimilation, and such other means of health, whether hygienic or medicinal, as may be indicated, the stomach has regained its tone, the gastric secretions again become equal to their great duties, and the processes of assimilation being restored to a healthy and normal state; when the steps should be retraced with caution and judgment, until he is again entitled to live, judiciously and temperately, on the various kinds of food, which civilisation and commerce have brought within his reach; avoiding, as common sense directs, those irregularities, or other errors, which may have, in the first instance, produced, or contributed to the dyspeptic symptoms.

“The adaptation of the general principles of dietetics, and all we know or have to learn of the chemistry of food, and the chemistry of the human system, to the treatment of different diseased conditions, must be regarded as no secondary duty of the medical man, and no inconsiderable and unimportant means of restoring health and preserving life. The importance and needfulness of the antiphlogistic regimen,—including a diet that is principally aqueous, and containing exclusively farinaceous aliment, and that in a minimum quantity,—have always been admitted and enforced; but more than this assistance in the treatment of disease, and the fulfilment of its indications, may be more and more looked for from dietetic researches. The dietetic management of the scorbutic, purpuric, anæmic, cachectic, and arthritic, conditions of the system, by corresponding modifications of diet, may be already adduced, as significant illustrations of the practical good that may be looked for in this direction, by further researches and a more zealous attention to this important department. Indeed, without a rational adaptation of dietetics to chronic as well as acute diseased conditions, their treatment must be rendered by so much more difficult, tedious, and uncertain,—even if the chances of restoration to health be not otherwise wholly done away with. A form of modern empiricism, unquestionably owes the proportion of success that has attended it, to such dietetic management,—and not to the infinitesimal doses of silica, and the like; and this may be fairly adduced as an illustration of how much dietetic management may effect in the cure of certain morbid states, without the assistance of any strictly medicinal treatment whatever. By simple attention to the quantity and quality of the daily rations, the number of the blood globules may be diminished or increased,—and febrile or inflammatory states moderated or even removed,—or an anæmic condition cured; by a modified vegetable diet, the scorbutic condition; by a mixed diet, the purpuric condition; by a fibrinous diet, the anæmic condition; by

a milk diet, the cachectic condition; by a less astringent diet, the arthritic condition; may be respectively relieved, in an important degree, without the aid of drugs; and, in many cases, it cannot be doubted, be more effectually and permanently influenced by such means.

“The dietetic management of children during all the years of growth,—and especially of the children born and bred in cities, exposed necessarily to the physical disadvantages of a deranged atmosphere, and the like,—is another great and important branch of practical dietetics; and one, in which greater and greater advances may be expected to be made. The avoidance of a dietary that is unduly stimulating on the one hand, or defectively nutritious on the other; the maintenance of power, the restoration of waste, the provision for the growth, with the least expense to the organs of assimilation, the least risk of irritation to the excitable mucous tissue; are obvious points to be arrived at by dietetic management,—and to secure which must be a sanatory gain of no secondary importance.

“The question as to the use and abuse of the alcoholic stimulants, is a third matter of much moment in the treatment of different morbid conditions, and in the management and preservation of the health of people, who begin life, or who have to maintain life, under such very different circumstances, as the producing and the consuming, the thinking and the toiling, the city-pent and the rural classes. To the rational medical man, who weighs well these different conditions, who sees disease so often proceed from, or so often aggravated by, conditions that habitual or occasional stimulants are alone able to counteract, or which may be most readily, or most surely and safely, thus antagonised and relieved, the question of teetotalism, in its attempted general application to all ranks and conditions of the people, must show itself to be unbased on sound theory or just practical inferences.

“The question as to the feeding of the indigent, the sick, the aged, and the labourer, brings the subject of dietaries within the direct influence of the Legislature, and renders its details and facts of inappreciable value. There can be no question, that, by dietaries which have been unequal to the wants of the system, or have not been adapted in character to the attendant circumstances of the life, disease, in its worst and most fatal forms, has been, many times, induced, in places of punishment, of well-intentioned charity, of manufacture, and of education; or that, without constant recurrence to the principles of dietetics, such occurrences may be reasonably expected to occur again. It is only a knowledge of the ordinary and the extraordinary expenditure of the system, of the varying expenditure dependent on age, season, climate, toil, &c., and of the nutritive qualities of different kinds of food, that can afford a secure basis for the establishment of useful dietaries, and adjust their modification to suit the various requirements of the economy under different circumstances.”—Pp. 349-355.

In conclusion, we have only to say, that while the medical reader seeking information will peruse this volume with advantage, it must prove highly useful to the general reader and invalid or dyspeptic, in warning what to avoid and what to chuse. It is highly creditable to Dr Robertson that, placed as he is in a situation where too often there are temptations to neglect dietetic rules, and trust entirely to the influence of mineral waters, he shows both the profession and the public that, without strict attention to the former, little or no benefit can be expected from the use of the latter.

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ART. IV.—*The Dublin Dissector, or System of Practical Anatomy*. By ROBERT HARRISON, M.D., M.R.I.A., Fellow of the R. C. of Surg. of Ireland and England, Professor of Anatomy and Surgery in the University of Dublin. Fifth Edition, with numerous Illustrations. Vol. i. and Vol. ii. pp. 871. Dublin, 1847. 12mo.

THE present work has been known since 1827, when it first appeared as a very excellent manual of anatomical description, whether for guidance in the dissecting-room, or for the purposes of private study. It has gone through four editions, always with more or less increase in size, and improvement in its internal characters.

The present, which is the largest, is certainly the most elaborate and ample; and we are satisfied that it is also the most complete. It is in the manual form, and printed on a very small but clear type. The additions are mostly on general and structural anatomy; a point as to the introduction of which at all, in a dissector's manual, different opinions will be entertained. Perhaps it had been better that this had formed a separate work. But Dr Harrison must be allowed to know best what his pupils require, and what they do not require.

It is unnecessary to give any detailed account of the arrangements and contents of this work. It is sufficient to say that the student will find in it a very correct and just view of the present state of anatomical knowledge, and much useful information in a condensed form on pathological anatomy.

The accompanying illustrations are very neatly executed; and may be useful in refreshing and maintaining the remembrance of the reader.

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## PART III.

### MEDICAL INTELLIGENCE.

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#### MEDICAL PATHOLOGY.

*Official Documents relative to the Fever of the Eclair. (Report on the Fever which affected the Crew of the Eclair on the coast of Africa and at Bona Vista. Presented by order of her Majesty to the House of Commons. London, 1846.)*

*Inclosure 1 in No. 10.—Mr Consul Rendall to the Earl of Aberdeen—(received March 9, 1846.)—British Consulate, St Antonio, Cape Verde, December 22, 1845.*—MY LORD,—The health of the inhabitants of the island of Bona Vista having been and continuing to be seriously afflicted with a bad fever, to which upwards of 250 persons have already fallen a sacrifice, and a belief being general that this dreadful scourge was introduced by Her Majesty's steam-sloop "Eclair," I beg to observe to your Lordship, that having been prevented by ill health and the want of opportunities of reporting to your Lordship any matter connected with this ill-fated steam vessel, I deem it best, at this date, to transmit to your Lordship a detailed account of all circumstances that transpired from the date of her arrival at Bona Vista from the coast of Africa to that of her departure for England, and of the subsequent events which transpired in the place to the latest date known. I feel that it is necessary I should be particular in reporting upon this subject, because the competent officers of the "Eclair" at all times pleaded that the fever which had appeared and existed on board was nothing more than the "common African coast fever." In this understanding, pratique was given, and subsequently, permission to land the sick; whilst it appears by two officers' report (Sir William Pym and Dr Arnott), after the "Eclair" arrived in England, "that in the first case of fever which occurred after leaving Sierra Leone, the black vomit appeared." The first case occurred in the beginning of August, and the "Eclair" did not arrive at Bona Vista until the 21st of the same month. I beg therefore your Lordship's patience in the lengthened statement I deem it my duty to make.

Her Majesty's steam-sloop "Eclair," Commander Estcourt, anchored in Bona Vista harbour the morning of the 21st August. Pratique was at once offered to Captain Estcourt, but he replied that he could not think of taking it until he had communicated the state of his vessel, and the fact of the French at Goree having kept him in quarantine during her stay there, to the authorities on shore, and he wrote to me to the same effect. I immediately communicated the facts to the Governor-General, and he desired the English surveyor (Dr Kenny) to repair on board, and to give pratique if the two or three cases of fever said to exist should prove to be the common African fever. Dr Kenny reported that he had seen the medical officers of the "Eclair," and that the fever cases were as had been described, and that he had given the vessel pratique.



The 30th of August Captain Estcourt complained of an increase in the number of sick, and was very anxious to remove them to the shore. A report however had gone abroad, that some of the fever cases had exhibited black vomit; and I mentioned the fact to Captain Estcourt, who assured me that he had heard nothing to cause foundation for such a report. Dr Kenny also wrote officially, and communicated with the medical officers of the vessel, but they declared the fever to be the common African fever. I then waited upon the Governor-General, in company with Captain Estcourt, and asked permission for the landing of the sick. The Governor-General advised with the Portuguese surgeon (who happened to be present), upon the propriety of such a step, and as to danger by contagion; when he answered promptly, "Oh no, your Excellency, no danger at all: I have often brought sick men on shore coming in vessels from the African coast, and I never knew any ill effects to arise." The Governor-General then ended the interview, by offering to Captain Estcourt the use of the fort upon the island, which was at once readily and gratefully accepted, and the crew, sick and well, were landed there. Part of the officers were permitted to live in the town, a house having been taken there.

Her Majesty's steam-sloop "Growler," Captain Buckle, arrived the 6th September, on her way to England. The crew of the "Eclair" continued to get worse, two or three cases dying daily. Captain Estcourt fell sick on the 10th; and the "Eclair" having then been nearly thoroughly overhauled, whitewashed, fumigated, cooled, and watered, by assistance from the shore, a board of officers agreed with Captain Buckle of the "Growler" in the propriety of the "Eclair" proceeding at once direct to England; and the two steamers left together the 13th September, the "Eclair" having had thirty-five deaths while in the harbour.

The anxiety which this vessel gave me during her lengthened stay was, I assure your Lordship, of the most painful description. The daily reports of deaths; the alarm of the people; the belief that the fever was one of the worst description; and the fear of subsequent consequences—were all of the most distressing nature, although the opinions of the medical men continued to be that the fever was merely the common African fever, and that no danger existed of its spreading among the people.

Captain Buckle, of the "Growler," thanked the Governor-General for all his kindness and attention to the officers and crew of the "Eclair," and in transmitting the communication in question, I joined in expressions of thankfulness to his Excellency, for the kind and handsome manner he had acted in the trying cases that had passed before us. His Excellency would not however permit me to carry out the desire of Captain Buckle, to put the fort into repair; and I beg to transmit herewith to your Lordship a copy of his Excellency's letter in reference to that subject.

The fears of the people had not subsided at the events already recorded, when it was reported, the 20th September, (seven days after the steamer had left), that one of the white Portuguese soldiers who had been housed at the island with the crew of the "Eclair," had died in the fort. The following day another also died, and the remaining soldier in the fort (a coloured man) was reported sick. Another coloured soldier was sent to assist his comrade, but who being also taken sick, the authorities at once abandoned the fort and island, and caused the two sick men to be brought to the town, and they were lodged in a house near the sea-beach.

Up to the 9th of October, extraordinary heat, and the fall of a large quantity of rain had been experienced, events which were surprising to the oldest inhabitant. The fever then began to show itself, and the first

fatal case in the town is said to have taken place in the house where the two coloured soldiers from the fort had been brought and recovered from their sickness. Each succeeding day, to the end of the month, gave two, and sometimes three cases daily, all occurring within the immediate neighbourhood of the house where the first death took place. A Portuguese surgeon had been brought from Porto Praia, who, with the Portuguese practitioner in the town, maintained that the fever arose from the presence of the stagnant water, and they so held the same opinion, until the 20th of November, when they openly declared it to be a fever of the worst description, and of a most contagious nature. From this date clean bills of health to vessels were refused, and all vessels leaving the port for any of the neighbouring islands, were subjected upon their arrival to be placed in quarantine for thirty days.

Up to the first week in December, the fever continued to rage, and at that period it had found its way into almost all the country villages—the deaths averaging seven and eight daily. The last report I have received from Bona Vista is to the 21st instant, to which date, 250 had died; but it is stated that for fourteen days previous there had been no deaths in the port and in three of the country villages, although the fever still existed in two of them.

No Portuguese resident of any note has suffered; the English have however suffered considerably, having lost one-third of their number, viz. Mr and Miss Pettingall, Dr Kenny, and two servants of Mr Macaulay. The sickness prevailed mostly amongst the lower orders, and consequently there was much misery, even for the want of common food; and I regret to say they had little or no medical advice or medicine. The leading symptoms of the disease was black vomit, pains in the head, back, and thighs, with a suppression of urine, and often the breaking of a blood-vessel. It is said that there was also a fever of a milder type prevailing, arising from the presence of the stagnant water, which had not the same alarming symptoms, and gave way to proper treatment. The fever proved contagious to those who acted as nurses to the sick; this was observed to be the case almost without an exception.

The medical men recommended the European residents to leave the island, and the Governor-General, his family, staff, and all the *employés* attached to head-quarters, left the morning of the 24th November for the island of Brava. The Governor of the island, collector, and others, had left for the island of Sal some days previous. Mr Macaulay and family, and Mr Pettingall and family, had also left some time previous for the island of St Nicolas. The latter, with his family, unexpectedly returned to Bona Vista, and his daughter died on the 24th November, and himself on the 5th of December, while performing quarantine at the island of St Nicolas. I have the honour to state to your Lordship that I came over here with my family the 1st of December, leaving the vice-consul at Bona Vista. The great excitement which I endured for nearly four months has, I regret to say, impaired my health very considerably, that a change of air became imperatively necessary.

I have been thus particular in detailing to your Lordship events as they occurred at Bona Vista, because I assure your Lordship that if the authorities of the place could have imagined that the fever on board the "Eclair" had exhibited a dangerous type before her arrival, they never would have granted the vessel pratique. The report of Sir William Pym and Dr Arnott says that such was the case; and the information appears to have been derived from the survivors on board the "Eclair." The medical men who belonged to that vessel are now numbered with the dead, yet it must always be a cause of regret that they were not more circumstantial in their statements, particularly to the medical officers who were deputed by the authorities to confer with them, as the dread-

ful loss of life I have here detailed to your Lordship would, no doubt, have been averted, besides saving to many persons great pecuniary losses, which the panic amongst the islands has caused to a very considerable extent.—I have, &c., (signed) JNO. RENDALL, *Her Britannic Majesty's Consul*.

*Inclosure in No. 42. Sir William Burnett to the Secretary to the Admiralty. Admiralty, November 22, 1845.*—In laying before their Lordships my observations on opinions given and the proposals made by the Superintendent-General of Quarantine, relative to the late events in the "Eclair," and transmitted to their Lordships by the Lord President of the Council, I must regret that I cannot coincide in these opinions, nor in the recommendations he has made relative to ships sailing from tropical climates; and even if I believed the disease to be of the nature, and endowed with the properties the superintendent assigns to it, I should deprecate in the strongest manner the course he wishes to see pursued.

It is perfectly evident from the history of the "Eclair" and her proceedings on the coast, that the fever in question arose from causes totally distinct from infection, that it was in fact the usual remittent fever of the coast, produced originally by the influence of marsh miasmata, heightened by the exposure of the men in boats when absent from the ship for many days together, to miasmatic influence, and to the subsequent irregularities which the men committed in Sierra Leone, when they unfortunately obtained leave to go on shore, and where great excesses were committed, which combination of causes has never yet failed to produce a fearful increase of febrile disease, particularly on the coast of Africa; and I may here add, that the increased mortality which took place whilst at Bona Vista is no longer a mystery: it was caused, I regret to say, by the most intemperate use of spirits I ever heard of. My informant told me that a bucket full of spirits had been offered to him. I do not mean to deny the possibility of this or any other fever becoming infectious under such circumstances as attended that in the "Eclair," but there is not the least proof that it was so, while there are circumstances and proofs that inevitably lead to a contrary conclusion. But be this as may, I have no hesitation in declaring my firm belief that the sick men of the "Eclair," when that ship arrived at the Motherbank, might have been landed at Haslar Hospital, and placed in the well-ventilated wards of the establishment without the public health suffering in the smallest degree.

It is a fact well known, and of the truth of which I can give the most satisfactory proof, that, during the autumn of every year, merchant ships arrive in our harbours loaded with the produce of the coast of Africa, having perhaps lost great part, nay, in some instances, the whole of their crew by the fever of the country, or some are still labouring under fever when the ship arrives in the Thames, and are sent to the hospital in that state, yet no instance is known of any infection having been produced by such procedure; in fact it is perfectly certain that it never did take place.

That the fever of which two men of the "Growler" died in the hospital at Woolwich, was attended with some yellowness of skin, and ultimately that the matter vomited was of a dark colour, I have no hesitation in allowing; but that any circumstance took place, either in the "Growler" or in the hospital, that could lead to a supposition that the fever was occasioned by contagion or infection, I most emphatically deny. The two men who were attacked at Woolwich and died in the hospital, slept immediately over the scuttle of the forehold, which, when the hold was disturbed, emitted a most unpleasant smell, which, when

I examined the "Growler," was pointed out to me by her commander. And I must also declare that the Superintendent-General of the Quarantine is most decidedly mistaken in assuming that there is any increase of heat in the deck of a steam-vessel where the men live, occasioned by the fires in the engine-room, which could maintain an artificial climate, so as to foster and bring the fever to England from the West Indies and coast of Africa. The fever did not arise from infection, but from marsh miasmata, the state of the ship's hold, the employment of the men in boat-service in an atmosphere prejudicial to the human constitution; and in the subsequent aggravation of these causes by excesses into which that part of the crew fell who had leave to go on shore. It is a well known fact, that vessels of war which have their cooking apparatus between decks, where the men live and sleep, such as flush-deck vessels, by which the temperature must be considerably raised, are uniformly the most healthy.

When the "Growler" arrived at Bona Vista, after the purser of the "Eclair" had died, a survey was ordered upon her (the "Eclair") purser's stores; a lieutenant, the paymaster and purser, and the clerk of the "Growler" officiating. The crew of the "Eclair," with the exception of a few Kroomeu and two whites, were all landed and living under tents, except some of the officers who were residing in the town of Bona Vista, and therefore no intercourse with the three officers above mentioned took place. Yet the lieutenant, purser, and clerk were severely attacked; the purser, when actually on board the "Eclair," showing distinctly that the disease was in the ship herself, as there were no persons on board to communicate it. Not a single person was taken ill in the "Growler" in consequence beyond the three mentioned.

It appears to me that the present is the occasion which ought not to be neglected, in which the infectious or non-infectious nature of the disease in question may be brought to a complete test and finally settled. It is perfectly well known that the communication between the inhabitants of Bona Vista and both the "Eclair" and "Growler" was entirely unrestricted, indeed so much so, that the late Commander Estcourt and the purser resided in the town. In short the parties mentioned visited and mixed together freely.

If it can be fully and satisfactorily shown that any person who had so visited the ship or tents where the sick were placed, contracted the fever in question and communicated it to others, and they to other persons in succession who had never visited the ships or sick, then there can be no reason to doubt the infectious nature of the disease; but if nothing of this kind has taken place, then the conclusion must be that the disease is not infectious, and is therefore incapable of being communicated; in either case, settling this long contested question.

Having stated so strongly my opinion of the impossibility of the public health being endangered by the placing in the clean and well-ventilated wards of an hospital patients labouring under the attacks of fever contracted on the coast of Africa, I must enter my solemn protest against the proposition the Superintendent-General makes of keeping a ship under such unfortunate circumstances at sea, and by not permitting them to leave the coast of Africa or West Indies till the season (November) has commenced, when, in the usual course of things, they must, with constitutions enervated in a high degree, encounter the cold and boisterous weather of the Channel.

The fate of the "Eclair" has, indeed, been most lamentable, losing not only the captain and other officers, and likewise so many of her crew, but, in addition to this, no less than four medical officers.

Supposing this ship had gone to the northward, as recommended by the communication under consideration, she would never have seen the

"Growler," and the places of those medical officers who died previously would not have been supplied. The disease proceeds, and there is no hand to help them; what must have been the fate of the remainder of the crew? I shudder to think of it. If to give contentment to foreign nations there must needs be something more done, why not establish a quarantine department in the Scilly Islands, under the charge of an active and intelligent medical officer of the navy? giving him the means of separating the sick from the healthy, and a comfortable hospital ship to place the sick in.

I am very sorry that circumstances have obliged me to touch on this *questio vexata* again, but, entertaining the opinions I do, and knowing that they are supported by nine-tenths of the profession, I could not, without a gross dereliction of duty, withhold them from the consideration of their Lordships.

The letter from the Council Office, dated the 13th instant, and its inclosure, are herewith returned.—I have, &c. W. BURNETT, *Director-General of the Medical Department of the Navy.*

*No. 46.—Sir William Burnett to the Secretary to the Admiralty.—Admiralty, December 11, 1845.*—SIR,—In conformity with their Lordships' directions that I should furnish them with my observations on the second report of Sir William Pym, relative to the fever which so lately and so fatally prevailed on board Her Majesty's ship "Eclair," and transmitted by the directions of the Lord President of the Council, to the Lords Commissioners of the Admiralty; I beg to submit the following, premising, however, that I mean as far as possible to confine my observations to the case of the "Eclair," as I can see no benefit which could be derived from entering generally upon the consideration of the subject of yellow fever, which would indeed be a most extensive one and occupy much time; and the more especially as I have already done so in my work on the fever of the Mediterranean, published in 1816.

Sir William Pym very justly states that he differs with me as to the nature of the fever which prevailed on board the "Eclair;" he considering it "a fever *sui generis*, known by the name of the African, Bulam, yellow, or black vomit fever, from its being attended in its fatal cases with the peculiar symptom of black or brown matter resembling coffee-grounds, a symptom which does not exist in the remitting fever; and another distinguishing particular is, that in this fever, patients after an attack of it never suffer from ague as in the remitting fever. That the fever has also a singular and peculiar character, viz., that like small-pox, measles, &c., it attacks the human frame but once. That it also differs from the remittent fever in being highly infectious, and has in consequence more than once been imported into the island of Ascension, very often into different West India islands, so late as 1843 into the Bermudas, and occasionally into the ports of Spain, particularly Cadiz and Gibraltar."

The whole of this as regards the peculiar properties of the disease called by Sir William Pym Bulam, &c. is a gratuitous assumption on his part, and in my opinion has no foundation in fact; and in my view of this part of the subject I am supported by the testimonies of nineteen-twentieths of the medical officers of both services, who are of opinion with myself, that the more ardent form of yellow fever is a mere modification of the bilious remittent so extensively known over all the tropical regions, and hence can have no infectious properties unless under such circumstances as I have stated in my former report, viz., an accumulation of sick in a crowded and ill-ventilated space, such as must have been the case in the "Eclair." I only suppose that this must have been the case in the "Eclair;" I have no proof that it was so.

With respect to such patients as have passed through this fever not being subject to second attacks, I beg to submit the following report from Drs Gray and Tait, Physicians of the Fleet, who were appointed in 1816 by the late Transport Board, in conjunction with Dr Harness, the Medical Commissioner, to investigate this question as regarded the Navy, which I think will finally settle it in the mind of every unprejudiced person, viz.—

*"London, August 28, 1816.*

"SIR,—We have examined with great care and attention the letters transmitted to your Board from the respective medical officers of the navy who have been called upon for their opinion relative to the contagious or non-contagious nature of the Bulam, or ardent yellow fever, and the liability or non-liability of the human frame to a second attack of that disease; and we have extracted from the said letters the several opinions of the respective medical officers on these points.

"That the accuracy of the opinions relative to the liability or non-liability of the human frame to a second attack of this fever, might be more clearly ascertained, we have examined a number of the surgeons' journals of ships of war employed in the West Indies, and we have traced a second attack to a considerable number of persons on board His Majesty's ships 'Circe,' 'Blonde,' 'Thunderer,' 'Pompeii,' 'Lily,' and 'Vimiera,' and that no doubt may exist as to the certainty of these attacks, and we have subjoined a list, the names of some individuals who have died with the fatal symptoms of black vomit, thereby affording a fair inference that although the symptoms of many of those who had suffered from a second attack might have been of a mild nature, yet the disease was the same with that generally denominated Bulam, or ardent yellow fever.

"With regard to the opinions of the surgeons of many of His Majesty's ships employed in the West Indies, relative to the origin or contagious nature of this disease, we have made copious extracts from the remarks inserted at the end of some of their journals, which, coming from men perfectly impartial, and who had the best opportunities of making observations and of forming a judgment on the point in question, may be considered of some importance. Those extracts we have annexed to others made from the letters of the medical officers, and we beg to inclose the whole for your information.—We have, &c.,

(Signed) "J. GRAY, }  
"WM. TAIT, } *Physicians.*

*To Dr Harness, &c., Transport Board.*

The number of persons in the respective ships who suffered the second or third attacks are as under, (and, if required, I can give their names):

|                    |              |   |     |
|--------------------|--------------|---|-----|
| His Majesty's ship | "Circe,"     | - | 27  |
| ...                | "Blonde,"    | - | 36  |
| ...                | "Vimiera,"   | - | 15  |
| ...                | "Thunderer," | - | 11  |
| ...                | "Lily,"      | - | 2   |
| ...                | "Pompeii,"   | - | 5   |
| ...                | "Amelia,"    | - | 4   |
| Total,             |              |   | 100 |

The periods between the first and second attacks varied considerably, being in some cases only a few days, whilst in others they extended to months, and in some more than a year or two years; and, if need be, I can adduce numerous other attacks of the same kind, in some of which the patient has had even three attacks and died at last.

But without at present following Sir William Pym further in his report, I proceed to prove that the fever which prevailed in the "Eclair"

was unquestionably a remittent fever, originating in marsh miasmata and the exposure of the men in boats during rainy weather, and continued by subsequent irregularities in Sierra Leone, and greatly increased by the same cause (the drinking of ardent spirits) at Bona Vista, which will, I presume, finally put the question at rest.

The "Eclair" left England for the coast of Africa in the beginning of the month of November 1844, and appears to have reached Ascension by the 1st of December, and was again at sea on the 8th, and on the 20th was in the river Gaboon. From this time the "Eclair" proceeded along the coast, anchoring for a short time at different places on the coast, and arrived off the Gallinas on the 13th of January 1845, continued cruising or anchoring on the coast, and on the 25th came to Seabar, weighed, and, on the 27th, again anchored off Seabar, sending away all the boats manned and armed in the morning, they returning to the ship in the evening. Nothing of any moment occurred after this during the early part of February, and the ship appears to have anchored at Sierra Leone on the 23d, continuing there till the 28th, and, on the 2d of March, the "Eclair" resumed her station off Seabar. During the remainder of February, all the month of March, and until the 18th of April, the ship continued perfectly healthy; a few cases of diarrhoea, and some other unimportant and common complaints, being the only ones on the sick list.

On the day above mentioned (18th April), three men, all of whom had been away in the boats, were placed on the sick list with remittent fever; one of them died on the fifth day of his illness, and two on the sixth day.

On the 20th, another who had been in the boats was placed on the list with remittent fever, and, after being forty-six days on the list, recovered.

The ship continued to move about the coast, and from this time until the 22d May there was no other case of fever.

On the 22d, three more men were placed on the list with remittent fever, who had been on boat service, one of whom died on the thirteenth day, one on the seventh, and one on the fifth.

On the 25th, another seaman, who had been on boat service, was put on the list with remittent fever, and died on the ninth day of his illness.

Some deserters were found in the river in a boat labouring under remittent fever, and were discharged on the 3d July for a passage to Ascension.

On the 29th, a boy was put on the list, and discharged on the 8th to duty; his disease was classed *febris remittens simplex*.

On the 4th June, another boy who had been on boat service was placed on the list with remittent fever and died on the third day.

On the 5th, a marine, who had also been on boat service, was added to the list with remittent fever, and died on the sixth day of his illness.

On the 8th, Mr C. Hall, the clerk, was placed on the list with continued fever, and died on the eighth day.

From this time the disease appears to have ceased on board, the ship still continuing on the coast in nearly the same position, and on the 15th July the "Eclair" anchored off Sierra Leone. While the ship was in this harbour, the crew, amongst other things, were employed in cleaning the hold of the "Albert," which the late surgeon, Mr Maconchy, reports to have been in a most filthy state; and where they also unfortunately had the opportunity of indulging to a great extent in intoxicating liquor of the worst kind; added to which, leave was given to the men to go on shore, where the same scenes followed in (if possible) an increased degree, and where many remained on shore all night in a shock-

ing state of intoxication, and were afterwards brought on board by the police.

The consequences of these irregularities soon manifested themselves.

On the 19th July, the fever again made its appearance, still being of the remittent type, in the person of a seaman who had been on shore on leave, and he died on the eighth day of his illness.

On the 21st, a seaman was sent with the same disease to the military hospital; this was his second attack. On the 22d and 23d, two more, who had been three or four nights on shore, came on the list and died on the fifth day of their illness.

On the 23d, the ship proceeded to sea with the "Albert" in tow, and anchored on the coast on the 8th of August, the men of the "Eclair" still employed in the vessel.

On the 29th, the next cases of remittent fever occurred in two seamen; these had been two nights and one day on shore in Sierra Leone, and one died on the ninth day of his illness, and the other on the nineteenth.

On the 31st, a third seaman, who had been the companion of the two preceding ones, was attacked by remittent fever, and died on the sixth day of his illness.

On the 1st August, there were two cases of remittent fever, which recovered after an illness of from twelve to eighteen days; both these persons had been employed in the "Albert."

On the 2d, two more cases of remittent fever occurred; one died on the second day, and one on the fifth. One of these had been in the "Albert," and the other on shore at Sierra Leone.

On the 8th and 9th, four were added to the list with remittent fever, two of whom recovered, and two died on the sixth day of attack.

On the 10th, the "Eclair" arrived in the Gambia with the "Albert," where the former remained thirty hours to coal.

On the 15th, they were at Goree, and one case was put on the list with remittent fever, and died on the thirteenth day of the attack, having got very wet two days before.

On the 18th, a seaman was added to the list with the same disease, and died after ten days' illness.

On the 21st, the "Eclair" anchored at Bona Vista, having then only five cases on the list with remittent fever, all of a serious nature.

On the 24th and 25th, four were added to the list with remittent fever; of these one died on the fourth day, and one on the sixth, both being stokers. Two recovered after being on the list eighteen days.

On the 27th, one case put on the list with remittent fever, and died on the fifth day.

The officers and crew of the "Eclair" were landed on a small island contiguous to Bona Vista, on which there was an old fort, in which the sick were placed on the 31st, and the remainder under canvass; and I have reason to believe that the officers lodged in the town of Bona Vista. The thermometer averaged 86° daily.

It is with great regret I have now to state, on the best information, that, while in this situation, means were found to supply the sick as well as the others with enormous quantities of ardent spirits, which were drunk with avidity, and produced the most deleterious effects; indeed, I have reason to believe, that some were absolutely killed by it, as if by poison. Had there not been a fever already in existence, the intense heat, (86° of Fahrenheit), the nature of the soil, and this dreadful intoxication together, would have been fully sufficient to have produced it, and one of the worst kind, too, in which irritability of stomach and dark-coloured vomiting would have been conspicuous symptoms.



The dates heretofore given have shown the progress of the malady from its first commencement in April to the arrival at Bona Vista on the 21st August, and up to the landing of the sick and ship's company, which took place on the 31st. In viewing the progress of the disease, their Lordships will not fail to remark that the fever had ceased from the 8th June till the 19th July, when the disease returned with renewed vigour, in consequence of the before-mentioned transactions at Sierra Leone, where also inebriation was carried on to a fearful extent, and was followed by the most deplorable consequences.

From the foregoing statements, it results that between the 3d of April and the 4th July there were seventeen attacks of remittent fever and ten deaths, all of the latter except one having been employed in the boats; that one exception was a stoker. From the 14th July till the 21st August, when the "Eclair" arrived at Bona Vista, there were twenty attacks and thirteen deaths, making in all, up to this time, thirty-seven attacks and twenty-three deaths, and covering a period of 150 days. This loss was indeed lamentable, but it is comparatively nothing to what followed the landing at Bona Vista, and the shocking scenes of drunkenness which took place. In the short space of thirty-seven days, that is, from the period the "Eclair" anchored at Bona Vista on the 21st August, till the arrival at the Motherbank on the 28th September, there were no less than ninety attacks and forty-five deaths.

Having thus traced the sickness which took place in the "Eclair" from its commencement to nearly its final termination, and shown in a manner which neither sophistry nor bold but unfounded assertions can overturn, that it undoubtedly arose in the first place from marsh miasmata, and in people employed in the boats; I must now observe to their Lordships, as Sir William Pym has asserted, that it was not a remittent fever, that this term remittent is applied, through the whole course of the disease, by the late surgeon, Mr Maconchy, by his assistant, Dr Hartmann, by the late Mr Bernard, and, finally, by Dr Stewart; and, further, that the notes kept of the disease, (some of which I have examined myself, and others have been examined by Drs Stewart and Bryson,) distinctly affirm this.

With respect to the pilot, Dr Stewart has from the first declared his opinion, that the disease of which he died did not appear to him to be the prevailing fever; at all events, he had none of the symptoms. Mr Rogers (surgeon,) was unfortunately obliged to sleep on board the "Eclair" for five nights before the removal of the sick from the malarious atmosphere of the ship to the "Worcester," after which no attacks of any moment took place, though there were a few slight ones in the case of some men employed in clearing out the hold; and, I have no doubt, had these men remained to be treated in the "Eclair," they would have had the disease severely and perhaps have perished.

Having thus proved the origin, nature, and causes of the disease to be entirely different from that assumed by Sir William Pym, I need scarcely proceed further, and there is not one word of my report of the 21st ultimo which it is necessary for me to change.

The case of the "Growler" is the same as the "Eclair," except that there is no reason to suppose that inebriation to any extent prevailed, and the disease is ascribed by the surgeon to the same malarious influence.

With respect to the importation of the disease into various places, except in one instance, and that even is surrounded with doubts, (I mean that of Her Majesty's sloop "Bann,") I entirely disbelieve it. Both the surgeons of Bermuda Hospital most distinctly deny, on two occasions, that the epidemic which prevailed in 1843, was imported or

contagious. I have also caused the medical reports of Jamaica Hospital for more than twenty years to be examined; and though hundreds of patients with yellow fever in all its most appalling forms, including black vomit, &c. have been treated in that establishment, not one of the medical officers in charge of the hospital have ever hinted at the disease being contagious; and, if it be needful, I can cite numerous other instances which I refrain from doing at present.

With respect to one attack giving exemption from a second, if what I have already said be not enough, I can give many other instances.

Before concluding, I trust their Lordships will pardon me if I again most respectfully urge that my former request be adopted, of sending a competent person to examine and inquire whether any disease of similar nature, traceable to the "Eclair," prevailed in that country subsequent to the departure of that ship from Bona Vista; it will do much to settle a question of great importance, equally interesting to the commerce of the country and to medical science.

I regret very much the occupation of their Lordships' time by so long a report, but I could not do justice to the important subject in a smaller space; and even now I have omitted very many important facts bearing on the question at issue which I might have stated with advantage; but I hope I have done enough. (Signed) W. BURNETT, *Director-General of the Naval Medical Department.*

*No. 47.—Medical Report of Her Majesty's steam-sloop "Eclair," from the 26th of August 1844 to the 15th of November 1845.*—The "Eclair," a new steam-sloop, was commissioned at Woolwich on the 26th August, with a crew of 140 officers and men, and fitted for sea with unusual dispatch. She remained on the home station until the beginning of November, having in the interim accompanied Her Majesty's yacht to Scotland, and made some trips between Portsmouth and Plymouth.

The usual venereal diseases of a newly raised crew were entered on the sick list; but only three medical complaints occurred whilst on the home station, viz. a case of pleuritis, catarrh, and of diarrhœa.

The ship left Plymouth on the 2d of November; encountered a gale immediately afterwards; was at Teneriffe from the 10th to the 14th, and reached Ascension on the 30th.

There were some entries on the list from boils on passing into hot weather, and altogether nine medical cases during the passage, viz. —two of rheumatism (in the same person), one of catarrh, one of diarrhœa, three of dyspepsia, and two of debility; the latter occurring in stokers and keeping them two or three days on the list.

In the absence of the medical journals for this period, it is impossible to state what was the nature of the cases of dyspepsia. Instances of abortive or ephemeral fever are afterwards frequently designated dyspepsia in the sick list of the late Mr Maconchy, the surgeon.

The vessel remained at Ascension until the 7th of December, and then proceeded to the coast of Africa. She was at the river Gaboon from the 20th to the 23d; at Fernando Po from the 25th to the 28th; at Whydah from the 31st to the 2d of January; at Accrah on the 4th; Cape Coast Castle on the 5th; Gallinas from the 13th to the 15th; and off Sherboro on the 18th.

One man was put on the list with synocha at Whydah, and was discharged to duty after three days' illness. There were five cases of catarrh, the old case of rheumatism, one of dyspepsia, one of diarrhœa, one

\* In examining these reports I find two instances noted of regularly formed intermittent fever assuming a continued form, and terminating in yellowness of skin, black vomit, and death.

of obstipation, detaining the man on the list for twenty-nine days, and one of colic and enteritis, in consequence of which the man was absent from duty for forty-two days, making altogether nine medical entries between the dates of arriving at Ascension and Sherboro.

The ship went into Sierra Leone on the 23d of January, and entered the extra complement of Kroomen and liberated Africans allowed on the coast (forty men). Whilst there, partial leave to go on shore was granted to the men. She left Sierra Leone on the 28th.

At that place the Captain's steward had cholera; there was also an entry with cynanche, and another with pleuritis.

No apparent inconvenience to the health of the crew succeeded to the indulgence of leave. Two men deserted.

With the exception of this visit to Sierra Leone, the ship was almost always off Sherboro, from the 18th of January to the 4th of July. In round numbers, she passed 130 days there, blockading the eastern outlet of the passage at Shebar; and during that time she lost altogether ten officers and men from fever, besides one man from drowning. It will be proper therefore to premise such information regarding the ship, and the medical topography of Sherboro, as was collected on the return of the ship to England.

In regard to the discipline on board, there appeared to be an earnest disposition to preserve the health of the crew. The duties, when not on boat-service, were not arduous: the alternate watches had the afternoon to themselves after March; the men were kept as much as possible out of the sun, by getting over the work aloft in the morning, and by regular use of the awnings. The usual blanket dresses were worn at night, and no person was allowed to sleep on deck; although the men were not obliged to sleep in their hammocks. In the absence of hammock nettings, the hammocks were placed on a platform on deck. At night the awnings, which were very lofty, were sloped down to the ship's side like a tent.

Mr Maconchy observes that "all the water in that country is said to be bad, except at one of the Turtle islands, which was too distant to obtain a constant supply of it; so they had to use some collected in the River Shebar, which held in suspension some vegetable matter, the precise character of which could not be known;" but to agency of which he ascribed three or four attacks like mild cholera.

Whether the water was collected at the one place or the other, an officer and coxswain accompanied the boats on the first four or five occasions of sending for it, and were in the habit of getting the boats pulled up as much as possible on the shore when detained at night; they sleeping in the boats, and the Kroomen on the shore and in the huts. After the death of one of the coxswains, the Kroomen went without any Europeans. The coxswain whose death is alluded to was employed in the other boating expedition.

Besides the water, another circumstance alluded to by Mr Maconchy, was that of depressing moral agency acting upon the crew, from seeing the prizes of other ships passing frequently to Sierra Leone, whilst they considered themselves out of the reach of such good fortune.

In regard to the ship herself, the main-deck where the men lived was lofty and roomy in proportion to the number of the crew. Aft, it was well ventilated; but the fore part was close as in most steam-sloops. The ventilation was derived from two hatches immediately aft and before the foremast, from scuttles in the ship's sides of good size, and, when the steam was not up, from a large opening which communicated between the after part of the main deck and the engine-room. When the steam was up, a large canvass screen was hung up at the break of the engine-room, which prevented the heated air in the engine-room

from passing into the main-deck ; whilst it was so contrived as to direct some of the cooler air upon the stoke-holes where the stokers were engaged.

The after hatchway led down to the extreme end of the main-deck ; the second hatch, before the foremast, had the same breadth as the other ; but it was not above fifteen inches in length, and its usefulness was much diminished by a large midship beam running fore and aft, and dividing it (the hatch) into two parts. This hatch was the only one leading in a straight line into the lower deck and fore-hold, and available for the transit of a windsail to the lower parts of the ship.

The closeness forward in the main deck was remedied as much as possible by Captain Estcourt, about March, by causing two circular openings, each about sixteen inches in diameter, to be made on each side of the fore-castle.

The lower deck was dark and badly ventilated, from having only the small hatch before the foremast leading down to it in a straight line from the upper deck. The after hatchway leading from the main-deck to the lower deck, was not under but before the after hatchway of the upper deck ; and so much so as to render any windsail inoperative ; nor were there any copper tubes leading from the lower to the upper deck as in some ships, or any gratings in the flooring of the main-deck as in others. Even the openings made so usefully forward in regard to the fore part of the main deck were comparatively useless for the store-rooms forward, as they were not in a line with the hatch leading from the main deck to the store-rooms.

The arrangement of the hatchways, affecting the ventilation of the lower deck, was still more felt in the forehold, a circumstance to be regretted in a newly-built ship, and particularly a ship surrounded, as the "Eclair" was for months, "by filthy-looking water, having all the washings of the rivers and mangroves." The position of the powder magazine rendered this evil irremediable.

The after hold was also cut from any direct communication with the upper deck, by not having the hatchways of the different decks in the same perpendicular lines.

The hatchway leading from the gun-room passage into that of the after store-rooms, was also out of the line of the hatchway of the deck above. Indeed it seemed as if there had been a studied avoidance of having the hatchways of the different decks in the same lines.

Some of the engineers and warrant-officers' cabins were close ; and it was said that the white paint was always affected by the bilge water. These two classes, however, returned to England with their numbers undiminished.

The stokers, on the other hand, lost nine out of fourteen men. The routine of their duty, and tables of the high temperature to which they were occasionally exposed, may be seen in one of the annexed papers. The chief engineer stated that the after stoke hole was particularly close under the coal-boxes, and suggested that by having a funnel leading down from the upper deck, through the steerage, and opening on a level with the flooring of the stoke-hole, a good supply of fresh cool air would always reach the stokers.

In adverting to the large mortality of the "Eclair's" stokers, it became a subject of inquiry whether that class suffered elsewhere in a larger proportion than other men serving in warm climates ; and it was stated that the mortality of the stokers in the East India steam-packets was very large ; whilst on the coast of Africa it did not seem that they were particularly obnoxious to disease. And on looking at the dates when the "Eclair's" stokers were taken ill with fever, a large number appear

to have been attacked, not when the ship was under steam, but after being some time at anchor.

The island of Sherboro is stated by Mr Maconchy to have been considered one of the most unhealthy places on the coast. The crew of the "*Ætna*" suffered from yellow fever when surveying its neighbourhood in 1837; and the crew of the "*Growler*" steam-ship became so sickly when there in 1844, that it became necessary to proceed to the Cape de Verd Islands to re-establish their health.

The position, form, and size of the island will be better understood by a glance at the chart than by any laboured statements. There is a marsh near West Bay, which was supposed to disturb the healthiness of a ship lying in the bay. The whole of the land, however, is low, thickly wooded, and abounding in rank vegetation; and the irregular outline on the northern face of the island is principally skirted by mangrove, or partially exposed mud banks. The islets in the Sherboro passage have the same appearance as the north side of Sherboro, an effect probably depending on the large rivers of the main land emptying themselves into the passage here, and depositing a portion of the matter which they sweep from the banks.

The distance of the ship from the shore, when off Shebar, is not known; but Mr Maconchy observes that "where they lay they were constantly in filthy-looking water—the washings of the mangrove marshes; for although there was a strong tide, yet the clear water never reached within miles, until they shifted further out to sea, which seemed to have some effect."

The ship afterwards anchored in from twelve to fourteen fathoms water, with Manna Point bearing from north-east to east, which would place her in from three to five miles from the shore. The bottom, it may be noticed, was a blue mud.

In the meteorological tables, calms, north-easterly and north-westerly winds have a prominent place; and it is understood that they had the usual land and sea-breezes, with intermediate calms of varying duration.

Whilst Mr Maconchy had his attention directed to the unhealthiness of the anchorage, it was nevertheless upon the boating parties that he considered the influence of the land was mainly exercised. During the time the ship was blockading Shebar, the boats were actively watching the country behind the island and to the westward of it. They were detached six times, and absent altogether twenty-nine nights, going once as far as Banana Island, but more usually up the Sherboro and to the Turtle Islands, sleeping, according to Mr Maconchy, "sometimes in the boats and sometimes on shore, but always more or less exposed to a tainted nocturnal atmosphere, after a hard day's pull had caused exhaustion." How often the boats' crews slept on shore is not known; but it is believed that they did so only on two occasions. On the last, rain and heavy weather set in shortly after they left the ship in the afternoon, when they made for the Sherboro. There the cutter grounded and required to be hauled over a shoal full half a mile in length. That difficulty being overcome, it was found that their anchor had become useless. It rained incessantly; and at midnight, after all in the boat had become as wet as it was possible, they took refuge for the night in a hut where there was a fire, leaving only the boat-keeper in the boat. Not a day in that cruise passed without rain, and the cutter's crew were less fortunate than the pinnacle's, who were well protected by large awnings and sails.

In tracing the effects of these boat expeditions upon the health of the men so employed, little inconvenience is apparent at first. In March,

a good many of the cases of diarrhœa appeared in persons usually employed in the boats, and one of the persons who returned on the 21st of March was attacked with fever on the 3d of April. This was the first severe case witnessed on board. The man was twenty-four days on the list.

Of another party returning on the 7th of April, two were seized with fever on the 18th, one on the 19th, and one on the 20th. Three of the four died.

Two of the same party were attacked with fever on the 22d of May, one on the 26th, and one on the 29th. All except the latter died.

Of the last party which returned on the 28th of May, two were taken ill on the 4th of June, and one on the 5th. These three belonged to the cutter's crew who slept in the hut, and two of the three died.

Eight of the ten deaths from fever at Shebar appear by this to have been consequent upon boat expeditions. The clerk and a stoker, who had not been out of the ship, however, died of a fever which appears to have been essentially the same as that with which the men employed in the boats were attacked. Mr Maconchy ascribed the illness of the clerk to the shock caused by his servant's death, and the fatal issue of his illness to fear. The only circumstance regarding the stoker was that "he had been a good deal lately about the fires."

In addition to the cases of fever which occurred amongst the proper crew of the "Eclair," three men belonging to the "Lily" were also treated. They had deserted from their own ship on the 4th of May, and were seized with fever on shore at Sherboro some days before they were brought to the "Eclair" by the "Albert's" boats on the 27th of May. They were very ill during the whole time they were on board the "Eclair," and were discharged into the "Penelope" on the 4th of July for passage to Ascension Hospital.

As the details of all the cases occurring after the beginning of May are given in the medical journals of the ship, no enumeration of the symptoms at second hand can be so instructive as the original cases. It may, however, be observed that the type of the fever was well marked remittent. Often, indeed, distinct intermissions are noted. But in those cases where the head had been much affected at the onset of the fever, the abatement or subsidence of the fever brought only partial relief to the head, and the subsequent paroxysms completed the mischief which appeared in the earlier stage of the illness, "the head remaining hot after the patients had become cold and the pulse had left the wrist." Where the stomach, again, seemed prominently disturbed, the illness was sometimes more insidious; medicine appeared to allay the vomiting for a time. The apyrexia was not only complete, but the pulse often also evinced no alarm. Even the tongue, although usually dry, if not rough, gave promise of amendment. But the recurring paroxysms soon removed the illusions.

There are records of three *post mortem* examinations, and some appearances very little short of black vomit are noted. In No. 220 of the sick list, "the stomach contained some reddish glairy matter." In 237, "the stomach was distended with dark serous fluid mixed with black flakes." In 221, "not a clot was seen in the body," but the fluid blood exuded from the nostrils and blistered back. Many said that one of the bodies became yellow after death, but no notice of such an occurrence appears in the medical records; and the parties making the statements, when examined separately, did not agree as to which body had become yellow.

Of the persons who died,

One was on the list three days,      One was on the list nine days.

Two were      five days,      One      eleven days,

Two were on the list six days,      One was on the list thirteen days.  
Two      "      seven days.

Mr Maconchy states in one of his notes, that "the immediate attacks consequent on these exposures were easily relieved, while the fatal disease never appeared until ten or twelve days after." And it is worth keeping in mind that one of the cases did not appear until the forty-fifth day, one not until the forty-ninth day, and one as late as the fifty-second day after the return of the boats.

In looking at the names of other men on the sick list who had been employed in the boats, several are entered under the heads of "cephalalgia," "dyspepsia," and "diarrhoea," to say nothing of the minor surgical accidents.

The cases of cephalalgia appear by the journal to have been frequently ephemeral fever. In the notes upon the cases of "dyspepsia," "headach, giddiness, acceleration of pulse, loaded tongue, bilious vomiting with or without purging, are enumerated as symptoms; and these cases also appear to have been abortive fever thrown off by critical discharges. The cases of dyspepsia occurred principally in May. In the first half of June, again, the bowels were more obviously disturbed than the stomach and biliary organs. Several were taken ill about the same time, frequently at night; and the attacks, like those of dyspepsia, were frequently attended with headach and loaded tongue. The illness was transient, and the men returned to duty on the second and third days after they were attacked. These cases of dyspepsia and diarrhoea appear to have been examples of the *febris introversa*; and on looking at the sick list at a later date, several of the persons who had these lighter ailments will appear afterwards amongst the earliest subjects of fever.

Although these disturbances appeared principally amongst the boats' crews, they were not confined solely to them.

The following table embraces events and diseases from the 18th of January to the 4th of July inclusively. The diseases already noticed as having appeared at Sierra Leone are also included.

| Medical Complaints. |          |            |            |        |             |          |               | Other Diseases. | No. of Days. |            |             |      | Thermom. |       |          | Bar.    |                      |
|---------------------|----------|------------|------------|--------|-------------|----------|---------------|-----------------|--------------|------------|-------------|------|----------|-------|----------|---------|----------------------|
| Fever.              | Headach. | Dyspepsia. | Diarrhoea. | Colic. | Rheumatism. | Catarrh. | Air Passages. |                 | At Sea.      | At Anchor. | Boats away. | Wet. | Dry.     | Mean. | Highest. | Lowest. | Mean height, Inches. |
| ...                 | ...      | ...        | ...        | 1      | 1           | ...      | ...           | ...             | ...          | ...        | ...         | ...  | ...      | ...   | ...      | ...     | ...                  |
| ...                 | ...      | 2          | ...        | 1      | ...         | ...      | 1             | Cholera, 1      | Jan.         | 4          | 10          | 4    | 0.14     | 82.22 | 86.21    | 79.92   |                      |
| ...                 | ...      | ...        | ...        | ...    | ...         | ...      | ...           | Erysipelas, 1   | Feb.         | 2          | 26          | 1    | 5.3      | 84.03 | 87.81    | 29.94   |                      |
| ...                 | ...      | 8          | 1          | 2      | 4           | 2        | 2             | Hepatitis, 1    | March,       | 2          | 29          | 12   | 10.21    | 84.12 | 87.81    | 29.9    |                      |
| ...                 | ...      | ...        | ...        | ...    | ...         | ...      | ...           | Syncope, 1      | April.       | 1          | 29          | 16   | 4.26     | 83.3  | 86.79    | 29.92   |                      |
| 5                   | 2        | 2          | 4          | ...    | 3           | 1        | ...           | ...             | May,         | 2          | 29          | 6    | 15.16    | 82.3  | 85.78    | 29.91   |                      |
| 8                   | 4        | 6          | 1          | 1      | 1           | 1        | ...           | ...             | June,        | 4          | 26          | 0    | 20.10    | 81.36 | 84.78    | 29.99   |                      |
| 4                   | ...      | 3          | 7          | ...    | ...         | 1        | ...           | ...             |              |            |             |      |          |       |          |         |                      |

It ought perhaps to be stated that the sick were hung up in the bows of the main deck; the arrangements of the hatchways making it impossible to place them as usual in steam-loops, abaft in the lower deck, on each side of the after-hatchway; and they occupied the same position until the end of August. Subsequent to their re-embarkation from Bona Vista in September, the worst cases were kept in the after part of the upper deck, where they were screened off from the rest of the crew and protected from the sun and the weather by sails overhead. The rest of the sick had the port side of the main deck appropriated to their

separate use, and the crew who remained well occupied the other side of the deck. As the weather became cool on the passage home, all the sick were treated below on the *main* deck.

The ship went into Sierra Leone on the 5th of July, anchoring close to the shore near the Commissariat Office, and remained there until the 23d. Four days before starting, fever began a second time to show itself amongst the crew, eventually attacking the greater number of persons on board, and proving fatal to upwards of sixty officers and men. It will be proper, therefore, again to notice some circumstances which occurred before its appearance.

Two days after going into harbour, the crew commenced clearing and white-washing the holds and store-rooms, a duty with which it appears by the log, that they were again engaged at the end of July and beginning of August.

In addition to clearing their own ship, a party was employed in paying off the "Albert" iron steam-ship, and fitting her for the service of the Lieutenant-Governor of the Gambia. This duty included, amongst other matters, the clearing of her holds, which did not appear to Mr Maconchy to have been previously attempted since the Niger Expedition, and was irksome from the strange accumulations found there. "The proper crew of the 'Albert' appear to have been paid off and committed great irregularities, which could not be entirely prevented. They got or took leave."

Captain Estcourt next determined to give leave to the crew of the "Eclair." Small numbers went on shore at a time, and the leave was limited to twelve hours. It is scarcely necessary to state what the habits of seamen are when on leave, or that the spirits in the stores usually visited by seamen at Sierra Leone are of the worst description. The leave was given in the midst of the rainy season, and not a day passed without rain during the time the ship was there. Five men deserted and were not heard of afterwards. Eleven others are said to have slept on shore, some of them for several nights; and three men, although not sleeping on shore, remained until late. The names of the men sleeping, &c. on shore will be found annexed. Some of those who came off at the expiration of their leave were allowed to go on shore a second time.

It may be proper to retrace the health of the crew before going into Sierra Leone. The medical complaints occurring in June are given above. The last case of fever at Sherboro was entered on the 8th of June; and on going into Sierra Leone there was only one medical case on board, a convalescent from fever. The sick list remained low at first as usual when leave is given, and for ten days after their arrival there was not a single medical entry. On the 16th there was a case of catarrh and another of diarrhoea; on the 18th a case of colic. On the 19th the first case of fever appeared in a man who slept on shore. On the 21st, another man who had been on the list with fever for forty-six days, had a second attack, and was at once sent to the Military Hospital. On the 22d and 23d, two other men who slept on shore were taken ill. The three men treated on board died.

The ship left Sierra Leone on the 23d of July with the "Albert" in tow, and with twenty of her crew on board that ship. They proceeded together to the northward, and remained at anchor from the 28th until the 8th or 9th of August, during which time a working party from the "Eclair," in addition to the twenty already noticed, were employed on board the "Albert." The two vessels went on the 10th into the Gambia, where the "Eclair" remained until the 15th.

It is scarcely necessary to add that their arrival at the Gambia was



in one of the most unhealthy months at that place. From the time of leaving Sierra Leone they had more or less rain.

The ship next called at Goree for coals and was refused pratique. She went on to Bona Vista, arriving there on the 21st of August, and here the authorities did not think it necessary to enforce quarantine.

After leaving Sierra Leone, three other men who slept on shore were seized with fever in July and died. A merchant who embarked on board the "Albert" at Sierra Leone was also taken ill, and died on board of that vessel on the 27th.

The first three of the crew attacked in August were also on board the "Albert" when taken ill. After this the fever became more indiscriminate in its attacks. Fifteen cases occurred in August before arriving at Bona Vista, of which seven were eventually fatal; and in this number are included two of the men who remained late at night whilst on leave at Sierra Leone.

The fever appears to have been as distinctly remittent as that at Sherboro, and some of the men had unequivocal black vomit. Some of the bodies, it was said, became yellow after death; but the medical journals do not intimate the fact. Perhaps the obscure light of the deck where the men were treated may have rendered any change of colour in the skin less obvious than on the upper deck, where the bodies might be seen by the crew previous to sewing them up in their hammocks.

Two days after their arrival at Bona Vista, the crew again commenced clearing the holds, removing the tanks, whitewashing, smoking, &c. On the 28th, the sick were removed into the captain's cabin; on the 31st, they and the crew were landed at a fort on a small islet near the town, where the sick had separate apartments from the rest of the crew. The officers—gun-room, midshipmen, warrant, and engineer, took a house for themselves and their servants in the town.

The duty of clearing, &c., went on by the Africans, under the charge of Lieutenant Harston, the first lieutenant, and two of the men, and every part of the ship, shelves, mess-places, cabins, and bed-places, underwent the same operation as the holds and store-rooms. During the last few days, thirty Portuguese labourers were on board the ship, and assisted in the duties of mooring, hoisting, and lowering, &c., but were not required to go below.

The residents at Bona Vista were healthy during the stay of the ship; but it is not undeserving of notice, that as far back as the time of Dr Lind, "St Antonio and St Nicholas were the only islands of the cluster (Cape de Verde) where strangers were exempt from a general sickness during the rains. These begin in July and continue until November." ("Health of Seamen, new edition, A. D. 1779.") So injurious to health, indeed, did Dr Lind consider Bona Vista, that he instanced its white sand as a mark of an unhealthy locality. However little we now value his explanation, we may not discredit his statement regarding its unhealthiness to strangers at the season alluded to by him. In the adjoining island, Porto Praya, there was yellow fever whilst the ship was at Bona Vista.

The thermometer ranged from 84° to 86°, according to a register kept by Mr Carter of the "Growler," during the last few days the vessels were together; but the nights felt cold. They had good sea-breezes from the north-east. On going to sea the thermometer fell 2°.

It has been stated that the authorities at Goree and Bona Vista took opposite views of the contagiousness of the fever. It may now be added that the health officers of Madeira and England agreed with those of Goree. The question having thus assumed a practical bearing, some circumstances which occurred at Bona Vista deserve notice.

1st. On the arrival of the ship, partial leave was given to the petty

officers, who went into the town, and one man slept on shore. 2dly. The sick were visited by two of the resident medical gentlemen, one going on board, the other going to the fort. 3dly. There was a Portuguese guard at the fort, whilst the crew of the "Eclair" were there, and the guard was changed three times during that time. The men mixed freely with the crew of the "Eclair," and two of them were flogged for selling grog to the seamen. 4thly. The clothes, and particularly the bedding of the crew and convalescents were aired daily, at least after Dr M'Clure joined the fort. 5thly. There was a good deal of other intercourse between the people of the town and the crew of the "Eclair" on the island, particularly where the boats were repairing; and one, a Spaniard, was particularly well known to the crew from his smuggling habits. 6thly. The officers and their servants resided in the town, as already stated; the former partook freely of the hospitality of their countrymen, and both they and their servants were often in the market. 7thly. Three of the officers who had passed through fever before their arrival, had their bedding with them in the town, and one of the three had his linen washed at Bona Vista. 8thly. Some of the officers and servants were attacked with fever whilst in the town. 9thly. The captain was taken ill whilst residing in the house of an English family. 10thly. The purser lived in the house of another English gentleman, when taken ill, and remained there until the day before his death. 11thly. The purser went to the consul when in a state of delirium, and not only communicated with him, but probably must have come near others. 12thly. Four months have elapsed since the ship left Bona Vista, and the public have not yet learned that the residents there have suffered from any of these circumstances.

It has however been stated, that the purser and clerk of the "Growler" got fever by going on board the "Eclair." If the fever of these officers was the consequence of their holding a survey on the purser's stores on board, on the 7th and 9th of September, that fact would not establish or confirm an opinion of the contagiousness of the disease. Whenever fever has prevailed much in ships on the West India and African stations, strangers going on board of these ships have been particularly liable to its attack; but on sending fever cases from these ships to the hospitals and private houses on shore, it has not been found that the disease extended from them. In regard to the officers now alluded to, their ship had only arrived from Sierra Leone when they were sent on board of the "Eclair," where, by the way, there were no sick at the time, and they were much incommoded by the smokes and fires. In their own ship there had been occasional attacks of fever for many months, viz. in May, twelve cases; in June, seven; in July, five; in August, when they had been at Ascension and only returned to Sierra Leone on the 26th of the month, three; in September, twelve; and in October, four. It surely is too much, then, to blame the "Eclair" for the illness of these gentlemen.

I am tempted, however, to follow the subject a little further. The purser, it was well known, had been much on shore at Sierra Leone during the rains in attending to his duty. There are four entries on the sick list of the "Growler" after arriving at Sierra Leone, and before he went on board of the "Eclair;" deducting, however, two of these as invalids, and probably, therefore, convalescents or valetudinarians, there are still two to be accounted for. The purser and clerk were taken ill on the 10th and 11th, and were separated from the rest of the crew by the engine-room; yet we find that on the 12th, a drummer, a stoker, and an A. B. are entered on the sick list with the same complaint. Is it not probable then that there was some other cause for the fever of all these persons, than contagion from the officers so far removed from

them? Is it likely again that the purser and clerk themselves would have fever so shortly after being on board the "Eclair," if the fever was contagious?

It is now more than time to return from these digressions. Sixty persons were attacked with fever at Bona Vista, and thirty-four of these eventually died.

There seemed to be a slight disposition to catarrhal symptoms on first arriving there, but without any abatement in the disturbance of the head and stomach, or in its remittent character.

On the 12th of September a consultation was directed by the senior officer, when it was recommended that the ship should proceed to Madeira, and if the fever received no check on her arrival there, that she should go on to England. Accordingly upon that and the following day the sick and crew were re-embarked, when the ship left Bona Vista, accompanied by the "Growler." She arrived at Madeira on the 20th, and having been refused pratique proceeded next day on her voyage, and anchored at the Motherbank on the 28th.

During the 9th, 10th, 11th, and 12th of September, the four days preceding embarkation, there were only two new cases of fever; whilst on the three succeeding days, the 13th, 14th, and 15th, there were fourteen. A large proportion of the latter, however, recovered. During the passage from Bona Vista to England forty-one cases occurred, twelve of which proved fatal.

The ship was put in quarantine immediately upon her arrival in England, and remained under the direction of the Council until the 31st of October, during which time there were nine new cases of fever, five of which proved fatal. And as there were some circumstances in which these differed from former attacks, it is proper to enter into a few of the particulars.

While the ship remained at the Motherbank two men were taken ill and died.

On the morning of the 1st of October a pilot went off from the shore, and having taken charge of the ship, proceeded with her to Standgate Creek, where she arrived on the 2d. He was, I believe, greatly alarmed from the moment he went on board. It is understood that he brought his bedding with him. He told me that he had eaten nothing after the first day he was on board. His meals were sent to him on the upper deck. He slept for a few hours, one night, in the gun-room, and the other night in the steerage; in neither of which places had there been any cases of fever after the death of Mr Maconchy on the 21st of September, nor was there any access from the gun-room and steerage to the main deck where the sick and crew were, except by passing first on the upper deck, a bulkhead without doors and the engine-room being interposed between the steerage and the main deck. Although nominally messing with the gunner, he was never on the main deck, or nearer the sick than the steerage.

On the evening of the 3d of September, the pilot and such officers and men as had not had fever, were sent on board the "Revenge;" the convalescents and those who had recovered were sent into another line-of-battle-ship, the "Benbow;" while the sick, nurses, medical officers, and Africans, remained with Captain Harston in the "Eclair." Neither of the two medical officers then on board had suffered from fever.

On the night of the 4th the surgeon was taken ill, and next day the assistant surgeon. The surgeon died.

On the 7th an officer on board the "Revenge" was seized with fever and brought back to the "Eclair." The pilot was also taken ill; but as he was excessively alarmed at the idea of going back to her, and as another ship was preparing for the sick, he remained in the "Revenge."

until the afternoon of the 8th, when he and all the sick in the "Eclair" who could bear removal were sent on board the "Worcester" (a large frigate.) The officer and pilot died.

The illness of the surgeon and assistant surgeon occasioned the sending two other medical officers on board the "Eclair;" one of whom, an assistant surgeon, who joined on the 5th of October, was attacked with fever on the 11th.

Five of the Africans had slight febrile attacks on board the "Worcester," which was much colder than their own ship. These men, however, were engaged during the day in the holds of the "Eclair." After a few days they were sent from the "Worcester" into the "Griffon" brig, and only one of them taken ill afterwards, although still working on board the "Eclair."

After the illness of the assistant surgeon on the 11th of October, there was an interval of ten days before any new cases of fever appeared amongst the white men. Meanwhile the holds and store-rooms of the "Eclair" were undergoing a third clearance by the Africans, under the directions of Captain Harston; but as they could not accomplish this alone, two of the sick attendants in the "Worcester" were sent on board during the day to direct them, without, however, going below. One of these men had slight fever and irritability of the stomach on the 21st. The second was in the hold on the 21st for less than half an hour, and was inconvenienced by the smoke of a fire burning there; on the 22d he also had slight fever. Both were bled at once and were on their legs next day.

A report went abroad that the fever in the "Eclair" was latterly typhoid. The two first fatal cases seen by me occurred in persons who had returned from the coast of Africa. In the first there was black vomit and a slight yellowness of skin, which became of a deeper shade after death. In the second there was hiccup during the last fifteen hours of life, and with the hiccup a plopping gurgling sound, which conveyed to my mind an assurance that had it been possible to examine the stomach after death, coffee-ground fluid would have been found in it. There was a slight tinge of yellowness in that case also during the last hours of life; and after death the body became very yellow, whilst the neck was as dark as if the patient had been strangled.

In the case of the pilot, on the other hand, the head appeared to bear the onus of the illness. There was at no time any sickness or any tinge of yellowness in the skin. The disease, however, proved fatal after he was a short time under treatment. In regard to the latter circumstance, from the appearance of the tongue when first seen, I am led now to think it probable that he had been ill for some time when he applied for assistance. The assistant surgeon, who joined in England like the pilot, had a considerable degree of fever with vomiting and headach at the onset; but he himself ascribed the state of his stomach to the presence of the previous day's undigested dinner; and there was no vomiting or sickness after the first morning.

At the time the pilot was taken ill I believed that his illness was entirely referrible to alarm; but looking at it afterwards in connexion with the illness of the assistant surgeon, who like himself had joined in England and had not been exposed to the influence of an African climate—the two together seemed decidedly to point to some taint within the ship, whether contagious or otherwise. They were the only persons, it should be observed, who were attacked with fever without being on the coast of Africa when the "Eclair" left Sierra Leone.

In adverting to this subject of contagion or infection, the circumstance of the "Growler's" return to England from the coast of Africa about the same time as the "Eclair," and sending to the Marine Infirmary at Wool-

wich two patients who died with all the characteristic marks of yellow fever, without an extension of the fever to any of the attendants there, must not be overlooked. No such test was applied to the fever of the "Eclair" after removing her sick to the "Worcester;" as the nurses and medical attendants had been engaged with the sick in the "Eclair," and any opinion hazarded can only be looked upon in the light of an inference.

The most suspicious circumstance known to me occurred at Shebar on the 4th of June, when No. 237 was "seized with purging, bilious vomiting, pain across the forehead and vertigo when removing the body of" No. 224, and next day had fever; but this lad had only then returned seven days from boating service, in the course of which he had slept on shore and been much exposed to the rains. It is also presumed that if he had derived his illness from contagion, the fever would not have been confined to him. On looking at the sick list, however, it appears that with the exception of two men employed in the boats like himself, and the clerk, who was taken ill four days after him, no other instances of fever occurred for the next six weeks, when the disease broke out a second time at Sierra Leone. The explanation then which I venture to offer is, that this lad's system had been charged with the fever during the time he was absent with the boats, and that his engagement with the corpse, whether impressing him through his senses or his moral being, operated simply as any other depressing agent might be expected to do under such circumstances of previous exposure.

The fact of the sick attendants from the "Worcester" getting fever after returning to the "Eclair" is not unimportant, and seems to me to point to some other cause than contagion.

The long continuance of the fever after the first application of the causes which produced it at Sierra Leone seems explicable, without calling in the aid of contagion: the frequent meddling with the holds; the visit to the Gambia at the worst season there, and with the crew already suffering from fever; and the subsequent sojourn at Bona Vista at a time of the year when, according to the high authority of Lind, strangers are liable to be visited by a general sickness, must all have been expected to favour the continuance of fever, if they did not engender it afresh.

Laying aside reasoning, however, other ships have had fever going on for three months after the first exposure to its cause, continuing too in spite of running away to the northward—without the accessory of steam to keep up the temperature of the ship—and only subsiding after the crew had been removed from the ship. (Birtwistle's account of fever in the "Volage," *Lancet*, January 3d, 1846.)

When drawing out this report I attached great importance to the supposed immunity of the inhabitants of Bona Vista from fever, after their intercourse with the crew of the "Eclair," as already stated. Since then an official communication from the Portuguese Consul-General, dated the 19th of January, has been published in the "Standard" newspaper of the 20th instant, announcing "that a malignant and contagious disorder had made its appearance at Bona Vista and St Nicholas, and that the most efficacious measures and precautions were being taken to prevent the spreading of a contagion of a typhoid nature, and supposed to be yellow fever." It only remains for me to state, as I attached so much importance to the supposed immunity of the inhabitants, I will most readily acknowledge my error if it shall appear that the fever with which the inhabitants at Bona Vista are afflicted, first made its appearance after a reasonable interval in any of those who had been in communication with the crew of the "Eclair" either in the town or at the fort; or if it first appeared amongst any of the Portuguese labour-

ers who were employed in the "Eclair" and subsequently extended either to the families of these labourers or any of their acquaintance who visited them when ill.

Of the cases of fever which proved fatal after going into Sierra Leone

|                                    |                                   |
|------------------------------------|-----------------------------------|
| Three men were on the list 2 days, | Five men were on the list 8 days, |
| Eleven ... 3 days,                 | Three ... 9 days,                 |
| Ten ... 4 days,                    | One ... 10 days,                  |
| Eighteen ... 5 days,               | One ... 13 days,                  |
| Eight ... 6 days,                  | One ... 18 days,                  |
| One ... 7 days,                    | One ... 19 days.                  |

In regard, again, to persons having more than one attack of fever during the service of the ship, six had two attacks, three dying; and one of the first cases was as severe as can be imagined. (No. 238.) One man died of the fourth attack.

An attempt was made to ascertain the number of cases in which the skin had become yellow. The medical records, however, are remarkably silent on this subject: although the two cases I saw proving fatal after returning from the coast were attended with yellowness, the hue becoming deeper after death, and the statements of some of the officers and men who had visited the sick or been in attendance upon them, and were afterwards employed in sewing up the bodies in their hammocks after death, lead me to think that in many instances the skin had become yellow and in others had large dusky mottlings. The statements, however, were so contradictory as to what bodies had taken on the one change of appearance or the other, that I cannot venture to offer even an approximation as to their numbers.

There are either records, or there were distinct recollections amongst several people, of twelve cases of black vomit. As this, however, only includes the names of persons about whom there was no difference of memory, the number is probably a good deal understated.

The following table exhibits the medical entries from the time of leaving Shebar until the ship was paid off on the 15th of November.

|                                                              | At Sierra Leone, from the 4th to the 23d of July. | From Sierra Leone to Bona Vista, between the 24th of July and 20th of August. | At Bona Vista, between the 21st of August and the 13th of Septem. | From Bona Vista to England, between the 14th and 28th of September. | In England between 29th of Sept. and 29th of Novem. | Total. |
|--------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------|--------|
| Fever                                                        | 4                                                 | 18                                                                            | 60                                                                | 40                                                                  | 9                                                   | 131    |
| Headach                                                      | 0                                                 | 3                                                                             | 0                                                                 | 0                                                                   | 0                                                   | 3      |
| Dyspep.                                                      | 1                                                 | 1                                                                             | 2                                                                 | 3                                                                   | 2                                                   | 9      |
| Rheumatis                                                    | 1                                                 | 0                                                                             | 1                                                                 | 0                                                                   | 1                                                   | 3      |
| Catarrh                                                      | 1                                                 | 3                                                                             | 2                                                                 | 3 (Kroonen)                                                         | 1                                                   | 8      |
| Diarrhoea                                                    | 1                                                 | 2                                                                             | 2                                                                 | 1                                                                   | 1                                                   | 7      |
| Colic                                                        | 1                                                 | 0                                                                             | 1                                                                 | 0                                                                   | 0                                                   | 1      |
| Intermittent Fever, Jaundice, and Cerebral affection—each, 1 |                                                   |                                                                               |                                                                   |                                                                     |                                                     | 3      |

There were also five slight fever cases amongst the Africans after arriving in England.

It is scarcely necessary to state that after arriving in England all the usual precautions of the Quarantine Establishment were of course enforced. In addition to separating those who had escaped fever from those who had passed through it, the bedding of all who went into the different ships was supplied afresh, whilst the men wore fresh clothing and had those previously in use duly immersed. After wards there were

the usual fumigations, whitewashings, plentiful immersions, smokings, and after the 23d of October washings of every part of the ship with the solution of chloride of zinc.

The crews were paid off whilst living in the different ships to which they had been sent on arriving at Standgate Creek.

(Signed) J. G. STEWART,  
*Deputy Inspector.*  
 London, January 24, 1846.

#### MEDICAL STATISTICS.

*Report on the Mortality of Edinburgh and Leith for the months of June, July, and August 1847.* By JAMES STARK, M. D., Fellow of the Royal College of Physicians of Edinburgh.—The mortality of Edinburgh during the months of June, July, and August 1847 amounted to 1634,—836 being males, 731 females, and 67 still-born. During the corresponding months of 1845 the mortality amounted to 931, and during the same period of 1846 the mortality was 1077. The mortality of the months of June, July, and August of this year, therefore, exceeds that of the corresponding months of last year by 50 per cent.

The mortality of Leith during the same period amounted to 166,—83 being males, 69 females, and 14 still-born. During the corresponding period of 1845 the mortality in Leith amounted to 128, during that of 1846 to 199. The mortality of the above-named months of this year is, therefore, 19 per cent. below that of last year.

The meteorological phenomena of the above months of this year differed considerably from those of the corresponding months of last year. Thus, the mean temperature of the months of June, July, and August 1847 was respectively  $57^{\circ}.83$ ,  $-61^{\circ}.22$ ,—and  $58^{\circ}.22$  of Fahrenheit's scale. The mean temperature of the corresponding months of 1846 was respectively  $63^{\circ}.45$ ,  $-59^{\circ}.25$ ,—and  $59^{\circ}.58$ . During June 1846 the thermometer ranged from 41 to 84 degrees; but during June of this year from 38 to 76. During July 1846 the range was from 46 to 79 degrees; but during July of this year from 42 to 83; in fact, in so far as mere temperature was concerned, it would seem as if the weather of June of last year had re-appeared in July of this. During August 1846 the range of temperature extended from 42 to 76; but during August of this year from 37 to 77. The mean temperature, therefore, of these months was lower this year than last year, while the variations or alternations of temperature were greater. In no respect, however, were the meteorological differences during this year and last more conspicuous than in the amount of rain which fell respectively during each of these periods. Thus during June, July, and August 1846 there fell a total of 12.77 inches of rain; but during the corresponding period of this year there fell only 4.07 inches of rain—or less than a third of the fall during the corresponding period of the previous year. In fact such has been the drought during the present season, that instead of having had a fall of 22.07 inches of rain during the past months of this year, as we had last year, which approaches the average, we have only had a fall to the extent of 11.57 inches. During the above-named months west winds blew  $40\frac{1}{2}$  days, east 19 days, south-west 14 days, north-west 8 days, south 5 days, north-east and south-east, each  $2\frac{1}{2}$  days, and due-north  $\frac{1}{2}$  day. The mean pressure of the atmosphere was 29.64 inches during June, 29.78 inches during July, and 29.68 inches during August—the barometer being 246 feet above the mean level of the sea.

The excessive mortality which Edinburgh has exhibited this year appears to have been produced by extrinsic causes which have no necessary connection with the conditions of the atmosphere or with the sanitary state of the town, viz. by the sickness and death which have pre-

vailed among the poor Irish who for months past have been flocking to the town to avoid the famine and pestilence in their own land. The diseases which these wanderers brought with them being propagated by contagion, many of the lower classes with whom they came in contact, were attacked therewith and fell victims thereto. That the sanitary condition of the town has not been the cause of the increased sickness is evinced from one single fact. When in May fever was found to prevail so extensively, that there was no room in the hospital for the numerous cases, measures were taken to get the lodging-houses and hovels frequented by these immigrants and by the lower classes thorough cleaned and white-washed, and, as far as possible, all nuisance and filth removed. Yet even this has not diminished the number of fever patients, the infection being kept up by the continued influx of Irish. In proof of the correctness of the above statement it may be mentioned, that on the 10th of June the number of fever patients in the Royal Infirmary was 473, on the 2d of September the number of fever cases amounted to 534.

The influx of Irish, however, has not alone vitiated the mortality statistics of Edinburgh during the past year, but has had a similar effect on many of the large towns of England and Scotland. As Scotland does not yet possess a Registration Bill no means exist of comparing the mortality here with that of other Scottish towns, but the Registrar-General of England's Quarterly Report for April, May, and June, enables us to compare the increase here with that of a few somewhat similarly circumstanced towns in England. The following table prepared from that report will show that we have not suffered worse than our neighbours from the above cause.

Table showing the ratio of increase in the mortality of different towns during the quarter ending 30th June 1847, over the corresponding quarter of 1846.

| Towns.         | Mortality<br>of Spring<br>Quarter, 1846. | Mortality<br>of Spring<br>Quarter, 1847. | Actual in-<br>crease during<br>1847. | Increase<br>per 100. |
|----------------|------------------------------------------|------------------------------------------|--------------------------------------|----------------------|
| Edinburgh,     | 1062                                     | 1529                                     | 467                                  | 43                   |
| Manchester,    | 1611                                     | 2362                                     | 751                                  | 46                   |
| Birmingham,    | 842                                      | 1263                                     | 421                                  | 50                   |
| Wolverhampton, | 500                                      | 847                                      | 347                                  | 69                   |
| Carlisle,      | 241                                      | 433                                      | 192                                  | 79                   |
| Liverpool,     | 2098                                     | 4609                                     | 2711                                 | 129                  |

Though it is not fair to compare a sea-port town like Liverpool with Edinburgh, the above table shows that several large towns in England, which have certainly not had a greater influx of Irish than Edinburgh, have yet experienced a greater increase in their mortality; for while the mortality in Edinburgh during the spring quarter of 1847 was only 43 per cent. greater than that of the corresponding quarter of 1846, that of the above-named towns (excluding Liverpool) exhibited an increase of from 46 to 79 per cent.

It is curious to observe that the increased mortality during the above-named months of this year over the corresponding months of last year seems to have been confined to three classes of disease—zymotic diseases, consumption, and old age. Thus, of the excess of 557 deaths, the class of zymotic diseases (epidemic and contagious) furnishes an increase to the number of 450; consumption an increase of 52; and old age an increase of 49. These furnish a total of 551, or within 6 of the total in-



crease—all the other diseases maintaining to each other nearly the same proportions as in former years.

The deaths from typhus fever have been very numerous during the above months, 389 having been registered under that head; whereas during the corresponding period of last year only 48 were registered under the same head. Of these 389 cases no fewer than 258 were males, and only 140 females, almost the whole being confined to immigrant Irish, and to the lowest class of the resident population. The youngest child recorded as having died from typhus fever was 3 months old; the oldest person 79 years of age. The chief mortality fell on those in middle life; and it is this fact which makes an epidemic of typhus fever prove a heavy calamity to a community, as by the death of the husband or parents it throws so many widows and orphan children in a state of destitution on the charity of the public. Thus 69 of the deaths from typhus fever were below 15 years of age; while 309 were between the ages of 15 and 60; and 20 above 60 years of age.

Small-pox has been rather prevalent among the lower classes, and in particular among those who have never been vaccinated. Of the 55 deaths produced by this cause 31 were males, 24 females. The chief mortality occurred among young children, 41 of the 55 cases being under 2 years of age. It was not ascertained that more than one of these cases had previously undergone vaccination.

The mortality of measles, which, during June and July, amounted monthly to 46, fell during August to 15; while whooping-cough cut off nearly the same number during each of these months. The deaths from diarrhoea, which numbered only 7 in June, increased to 11 in July, and to 18 in August. During August bowel complaints, including a few cases of British cholera, became frequent, but not nearly so prevalent as during the corresponding period of last year. This fact of itself shows that the common belief as to the autumnal bowel complaints being caused by eating fruit is not altogether correct. Last year fruit of all kinds was scarce, yet bowel complaints and British cholera were very prevalent during the intense heats of June, before there was any fruit in the market, and continued so during the three following months, during which the temperature kept at the high mean of 59 degrees. This year, again, fruit of all kinds has been abundant and cheap, but as the temperature has never been continuously very high, and the alternations of temperature have been greater, bowel complaints have not been nearly so prevalent.

Only 4 deaths have been registered under scurvy during the above months. No death, however, appears to have been caused by it during August, and the disease here in all its varied forms is rapidly disappearing.

Consumption has been unusually fatal during the above months. During June, July, and August of last year the mortality from consumption amounted to 148; during the corresponding months of this year the deaths numbered 201. It does not very clearly appear to what cause this increased mortality is owing. Part undoubtedly is attributable to the increased numbers of the population caused by the presence of the immigrant Irish, part to the greater and more sudden alternations of temperature to which we have been exposed during the past months. Perhaps, however, the scorbutic tendency which was so general among the population during the earlier months of this year has had more to do with this increase than either of these. The debility and generally vitiated or unhealthy state of both solids and fluids to which this disease, or the tendency thereto, occasions, would seem to favour those morbid changes in the lungs which give rise to and characterise consumption;

and it is an undoubted fact that during the past months of this year many cases of consumption have proved rapidly fatal which in other seasons would have hung over for months or years. Confirmatory of this view we have the fact that inflammation of the lungs has been more prevalent and fatal during the present year than for very many years past, and we all know that an attack of inflammation in the lungs is often the first step towards the formation of consumption.

It is worthy of note that notwithstanding the increased general mortality, the number of still-born children has been considerably fewer during the above months than during the corresponding months of last year. Thus they amounted to 67 only during the above months of this year, but to 86 during the corresponding months of last year. The cause of this would form an interesting subject of inquiry.

Leith not being subject to the inroads of the immigrant Irish, illustrates better than Edinburgh the influence of atmospheric agencies on the health. The excessive heats which prevailed during the months of June, July, and August last year, having been more moderate this year, and the alternations of temperature greater, the consequence has been that the mortality of the above months has fallen 19 per cent. below that of the corresponding period of last year.

The following is the abstract of the mortality tables of Edinburgh and Leith for the months of June, July, and August 1847, classified according to ages and diseases.

TABLE OF AGES.

| Ages.        | EDINBURGH. |     |       |     |         |     | LEITH. |    |       |    |      |    |
|--------------|------------|-----|-------|-----|---------|-----|--------|----|-------|----|------|----|
|              | June.      |     | July. |     | August. |     | June.  |    | July. |    | Aug. |    |
|              | M.         | F.  | M.    | F.  | M.      | F.  | M.     | F. | M.    | F. | M.   | F. |
| Still-born,  | 11         | 10  | 13    | 9   | 14      | 10  | 1      | 4  | 2     | 2  | 3    | 2  |
| 1 yr. & und. | 39         | 27  | 44    | 42  | 37      | 40  | 3      | 5  | 5     | 4  | 3    | 6  |
| 2            | 24         | 33  | 28    | 33  | 24      | 23  | 6      | 1  | 7     | 3  | 5    | 5  |
| 5            | 32         | 22  | 21    | 23  | 25      | 22  | 1      | 5  | 1     | 1  | 5    | 5  |
| 10           | 11         | 14  | 13    | 10  | 10      | 7   | 0      | 0  | 1     | 1  | 2    | 1  |
| 15           | 2          | 3   | 6     | 1   | 9       | 3   | 0      | 0  | 0     | 1  | 1    | 0  |
| 20           | 17         | 12  | 18    | 5   | 7       | 5   | 1      | 0  | 1     | 2  | 1    | 1  |
| 30           | 31         | 20  | 41    | 38  | 29      | 16  | 1      | 0  | 3     | 1  | 0    | 0  |
| 40           | 37         | 21  | 26    | 19  | 29      | 28  | 5      | 3  | 2     | 1  | 2    | 0  |
| 50           | 26         | 23  | 27    | 16  | 37      | 32  | 2      | 2  | 1     | 1  | 1    | 0  |
| 60           | 28         | 15  | 22    | 17  | 16      | 13  | 1      | 0  | 4     | 3  | 2    | 0  |
| 70           | 13         | 16  | 16    | 25  | 22      | 19  | 1      | 3  | 0     | 4  | 6    | 5  |
| 80           | 13         | 23  | 17    | 15  | 11      | 17  | 3      | 2  | 3     | 0  | 2    | 2  |
| 90           | 4          | 4   | 10    | 4   | 2       | 9   | 0      | 1  | 1     | 1  | 0    | 2  |
| 100          | 0          | 1   | 0     | 1   | 0       | 0   | 0      | 0  | 0     | 0  | 0    | 0  |
| Not stated,  | 2          | 1   | 4     | 1   | 6       | 6   | 0      | 0  | 0     | 1  | 0    | 0  |
| Total,       | 290        | 251 | 306   | 259 | 278     | 250 | 25     | 26 | 31    | 26 | 33   | 25 |
|              | 541        |     | 565   |     | 528     |     | 51     |    | 57    |    | 58   |    |

## CLASSIFIED TABLE OF DISEASES.

| Class.       | DISEASE.                          | EDINBURGH. |      |      | LEITH. |      |      |
|--------------|-----------------------------------|------------|------|------|--------|------|------|
|              |                                   | June       | July | Aug. | June   | July | Aug. |
| I.           | Small-pox, . . .                  | 31         | 14   | 10   | 2      | 4    | 5    |
|              | Measles, . . .                    | 46         | 46   | 15   | 0      | 0    | 0    |
|              | Scarlet Fever, . . .              | 0          | 0    | 3    | 0      | 1    | 1    |
|              | Whooping-cough, . . .             | 24         | 27   | 21   | 5      | 2    | 3    |
|              | Croup, . . .                      | 2          | 4    | 4    | 0      | 0    | 2    |
|              | Thrush, . . .                     | 0          | 5    | 0    | 0      | 0    | 0    |
|              | Diarrhoea, . . .                  | 7          | 11   | 18   | 1      | 0    | 0    |
|              | Dysentery, . . .                  | 0          | 1    | 1    | 0      | 0    | 0    |
|              | Influenza, . . .                  | 1          | 0    | 0    | 0      | 0    | 0    |
|              | Remittent fever, . . .            | 1          | 0    | 1    | 0      | 0    | 0    |
|              | Typhus fever, . . .               | 128        | 139  | 131  | 2      | 8    | 0    |
|              | Erysipelas, . . .                 | 2          | 4    | 0    | 0      | 0    | 0    |
|              | Syphilis, . . .                   | 1          | 0    | 0    | 0      | 0    | 0    |
| II.          | Hæmorrhage, . . .                 | 1          | 1    | 3    | 1      | 0    | 0    |
|              | Dropsy, . . .                     | 8          | 9    | 9    | 0      | 3    | 2    |
|              | Abscess, . . .                    | 0          | 0    | 2    | 0      | 0    | 0    |
|              | Anæmia . . .                      | 0          | 0    | 0    | 0      | 0    | 1    |
|              | Atrophy, . . .                    | 0          | 0    | 0    | 0      | 0    | 1    |
|              | Scurvy, . . .                     | 3          | 1    | 0    | 0      | 0    | 0    |
|              | Scrofula, . . .                   | 0          | 1    | 0    | 0      | 0    | 0    |
|              | Cancer, . . .                     | 1          | 2    | 3    | 0      | 1    | 2    |
|              | Tumour, . . .                     | 0          | 1    | 0    | 0      | 0    | 0    |
|              | Debility, . . .                   | 8          | 13   | 5    | 0      | 1    | 1    |
|              | Sudden death, . . .               | 1          | 0    | 2    | 0      | 0    | 0    |
| III.         | Hydrocephalus, . . .              | 14         | 14   | 18   | 1      | 3    | 3    |
|              | Apoplexy, . . .                   | 2          | 6    | 7    | 0      | 0    | 1    |
|              | Paralysis, . . .                  | 9          | 8    | 5    | 0      | 1    | 1    |
|              | Convulsions, . . .                | 4          | 3    | 4    | 1      | 1    | 0    |
| IV.          | Other diseases of brain, &c.      | 11         | 8    | 7    | 2      | 1    | 1    |
|              | Bronchitis, . . .                 | 1          | 0    | 4    | 0      | 0    | 1    |
|              | Pneumonia, . . .                  | 15         | 17   | 7    | 8      | 0    | 4    |
|              | Asthma, . . .                     | 6          | 2    | 3    | 0      | 0    | 0    |
|              | Consumption, . . .                | 58         | 73   | 70   | 4      | 6    | 6    |
| V.           | Other dis. of respiratory organs, | 10         | 8    | 6    | 0      | 0    | 0    |
|              | Heart disease, aneurism, &c.      | 12         | 5    | 9    | 1      | 2    | 0    |
| VI.          | Teething, . . .                   | 6          | 9    | 9    | 0      | 3    | 3    |
|              | Enteritis, . . .                  | 18         | 8    | 12   | 2      | 2    | 2    |
|              | Tabes mesenterica, . . .          | 11         | 18   | 17   | 3      | 4    | 4    |
|              | Other dis. of organs of digestion | 9          | 8    | 14   | 1      | 0    | 3    |
| VII.         | Kidney and urinary diseases,      | 4          | 3    | 3    | 0      | 0    | 0    |
| VIII.        | Child-birth, . . .                | 5          | 2    | 4    | 1      | 0    | 0    |
|              | Disease of uterus, &c.            | 1          | 2    | 1    | 0      | 0    | 0    |
| IX.          | Rheumatism, . . .                 | 1          | 1    | 1    | 0      | 0    | 0    |
| X.           | Spine and joint disease,          | 0          | 1    | 2    | 0      | 0    | 0    |
|              | Ulcer, Fistula, &c. . .           | 1          | 0    | 0    | 0      | 0    | 0    |
| XI.          | Old age, . . .                    | 45         | 50   | 48   | 8      | 8    | 4    |
| XII.         | Intemperance, . . .               | 0          | 1    | 0    | 0      | 0    | 0    |
|              | Violent deaths and suicides,      | 6          | 8    | 19   | 3      | 1    | 1    |
| XIII.        | Still-born, . . .                 | 21         | 22   | 24   | 5      | 4    | 5    |
|              | Causes not stated, . . .          | 6          | 9    | 6    |        | 1    | 1    |
| Total, . . . |                                   | 541        | 565  | 528  | 51     | 57   | 58   |

MISCELLANEOUS.

*Medical Graduations at Edinburgh.*—On the 2d of August 1847, the Senatus Academicus of the University of Edinburgh conferred the Degree of Doctor of Medicine on the following gentlemen, in number fifty-eight, after having gone through the appointed examinations, and defended publicly their Inaugural Dissertations.

OF SCOTLAND.

William B. Baikle, on Temperament.  
George R. Ballingall, on Neuralgia.  
James W. Begbie, on some of the Pathological conditions of the Urine.  
William R. Beilby, on Abscesses connected with the Cæcum.  
William Clark, on Hip-Joint Disease.  
James F. Cruickshank, on Onychia and Paronychia.  
James Donaldson, on the Action of Medicines.  
William Eadie, on Vaccination.  
George Fleming, on the Nature and Causes of Typhus Fever.  
James Fraser, on Insanity.  
James B. Kirk, on Necrosis.  
Martin B. Lamb, on the Reflex Actions of Animals and their Nervous Organs.  
David C. Laurie, on Asiatic Cholera.  
Thomas Leckie, on Tumid Spleen.  
Henry D. Littlejohn, on Pertussis.  
Robert Lyell, on the Mutual Relation between Pulmonary and Cardiac Diseases.  
Mungo J. Martin, on Dysentery.  
Colin M. M. Miller, on Mortification.  
John M. Mackenzie, on Indigestion.  
Nicolson C. Mackenzie, Sketch of the Medical Topography of the North of Scotland.  
John Robertson, on the circumstances which Modify the Action of Remedies.  
John Smith, on the Probable Causes of Continued Fever.  
John Sykes, on Pneumonia.  
John Urquhart, on Dropsy.  
William Williamson, on Hanging and Strangling.

BERWICK.

Collingwood F. J. Thompson, on Cynanche Trachealis.

FROM ENGLAND.

Henry Armstrong, on Intermittent Fever.

Samuel B. Bennett, on Cynanche Trachealis.

Richard Colthurst, on Pleurisy.

Edward H. Cree, on the Principal Diseases affecting Europeans in China.

Henry Crossby, on Phlebitis.

William England, on Pericarditis.

Robert C. Foreman, on Practical Observations on some forms of Dyspepsia.

Henry Gardner, on a consideration of some of the Causes and Principles of Dropsy.

Robert Gething, on Small-Pox, Inoculation, and Vaccination.

John H. Gibson, on Sudden Death.

George H. Kingsley, on Dropsy.

Joseph S. Lavies, on the Pathology of Bright's Disease of the Kidneys.

William Paley, on Malignant Cholera.

Philip L. Scratchley, on the Typhoid or common continued Fever of Paris.

Robert Smith, on Scorbutus.

Arthur C. Sydenham, on Croup.

Mallalieu Taylor, on the Anatomy of the Uterus and Placenta considered in relation to Uterine Hæmorrhage.

Aylmer St A. Wilson, on the Chemical Actions of certain Remedies.

FROM WALES.

Thomas Davies, on Cephalalgia.

Edward Waters, on the Fever of Edinburgh in 1846-7, including the Abdominal Typhus.

FROM IRELAND.

Henry Murney, on Tetanus.

James V. M'Cormick, on Uterine Hæmorrhage dependent on Placental Presentation.

Philip S. Warren on Auscultation and Percussion.

Alexander Watson on Acute Pleurisy.

FROM CANADA.

Henry G. Butts, on Erysipelas.

Annibal Maguire, on Acute Abscesses of the Internal Iliac Fossa.

FROM ANTIGUA.

Grahame Auchinleck, on the Circulation of the Blood in Lower Animals as compared with that of Man.

FROM SOUTH AMERICA.

William G. Morris, on Vitality.

FROM INDIA.

Edward W. C. Kingdom, on Gun-shot Wounds.

Daniel Macqueen, on Malaria.

George R. Pemberton, on Carcinoma, or Cancer.

Christopher K. Ord, on the Induction of Premature Labour.

*Surgeon's Hall, Edinburgh, 1st September 1847.*—Since Lammas 1846, the following gentlemen have offered themselves as Candidates for the Diploma of the Royal College of Surgeons of Edinburgh, and after producing satisfactory evidence that they had completed the course of study prescribed by the College, have been admitted to examination, and found qualified to practise the arts of Anatomy, Surgery, and Pharmacy, and have received Diplomas as Licentiates of the College accordingly.

| <i>Scotland.</i>        | <i>Mackenzie, Nicolson C.</i> | <i>Ireland.</i>       |
|-------------------------|-------------------------------|-----------------------|
| Beveridge, Robert       | Reid, William Duncan          | Boyd, Henry           |
| Ballingall, George R.   | Reid, William Legge           | Brown, William        |
| Baikie, William Balfour | Robertson, James              | Bray, Martin Joseph   |
| Campbell, John          | Robertson, John               | Conway, Bernard       |
| Clark, William          | Scott, Alexander              | Gallagher, James      |
| Cockburn, John          | Smith, John                   | Lyndsay, Henry S.     |
| Donaldson, James        | Stuart, Charles               | Holmes, George Smyth  |
| Duncan, James           | Thomson, Thomas               | Mitchell, George      |
| Eadie, William          | Wallace, Walker               | M'Lure, Andrew        |
| Eddie, John             | <i>England.</i>               | M'Cormick, James V.   |
| Farquhar, Thomas        | Bow, John Campbell            | Patrick, William      |
| Fraser, James           | Brown, Andrew                 | Rogers, Robert        |
| Green, Alexander        | Crooke, Edward Gylles         | Thomson, John         |
| Grier, Alexander        | Gibson, John Haydock          | <i>Abroad.</i>        |
| Husband, William        | Moyle, Geo. William           | Bivár, Rodrigo Soares |
| Keith, James            | Scratchley, Philip Lewis      | Cid de                |
| Laurie, David Crawford  | Smith, John Brumly            | Foulis, Robert        |
| Mackie, George          | Smith, Charles Pitman         | Kingdom, Edward W.C.  |
| Mackie, George          | Taylor, Mallalieu             | Morris, William G.    |
| M'Ewen, Dugald          | White, Joseph                 | M'Queen, Daniel       |
| Mason, George           | Williams, Henry L.            | Ord, Christopher Knox |
| M'Tavish, Neil          | Wilson, Aylmer St A.          | Reed, Charles         |
| Muirhead, James         |                               |                       |

Extracted from the Records of the Royal College, by

JOHN SCOTT, Secy.

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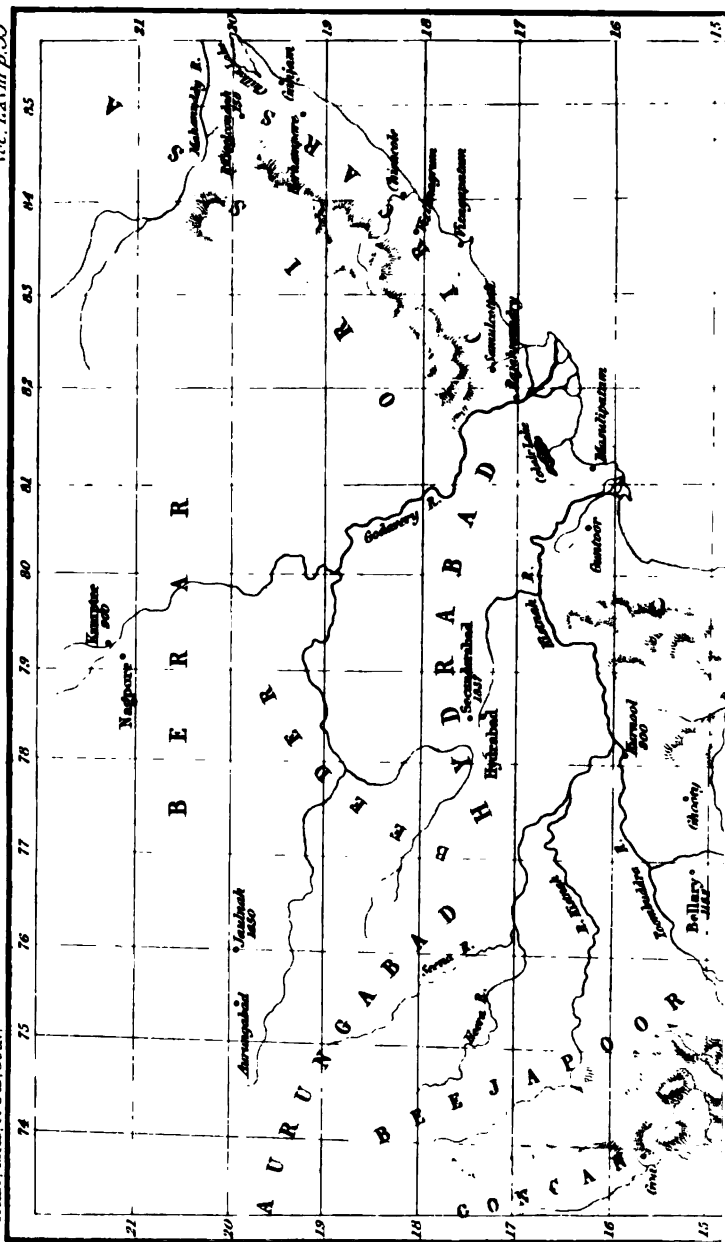






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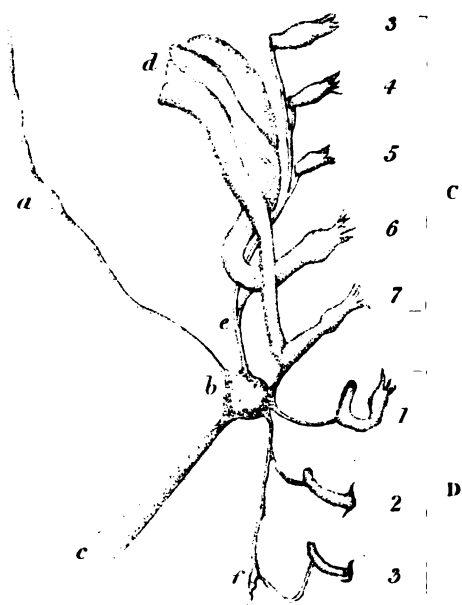


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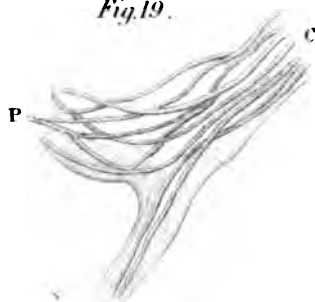


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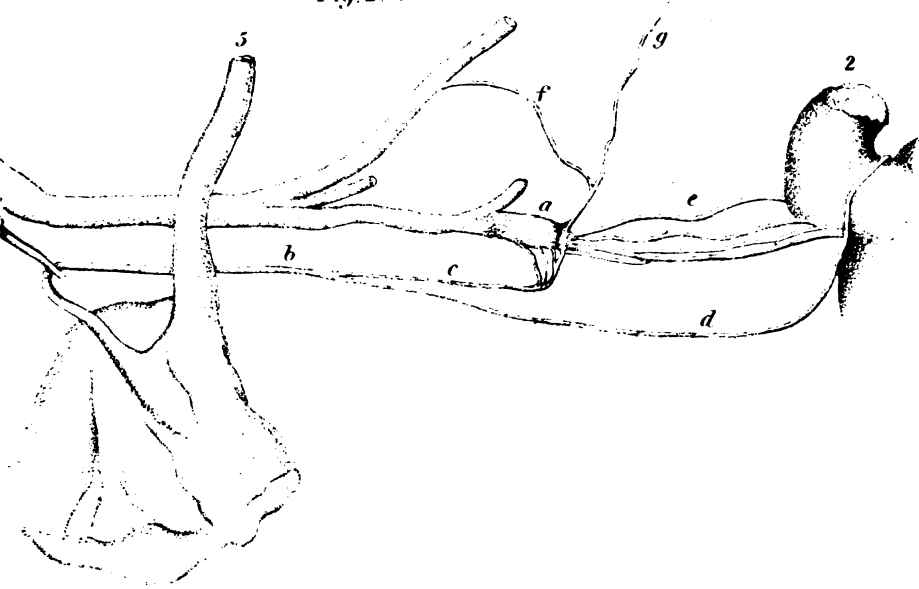




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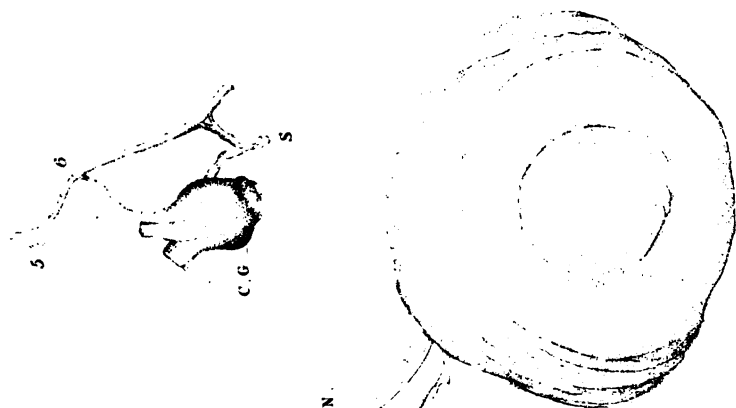


Fig. 23



Fig. 21





*Fig. 24*

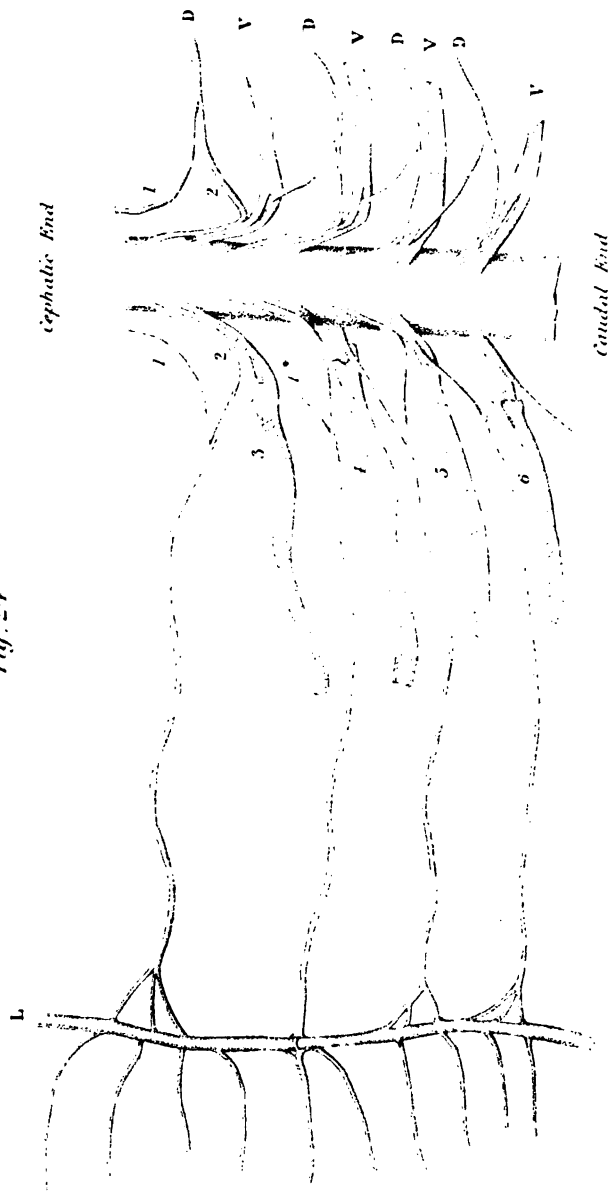






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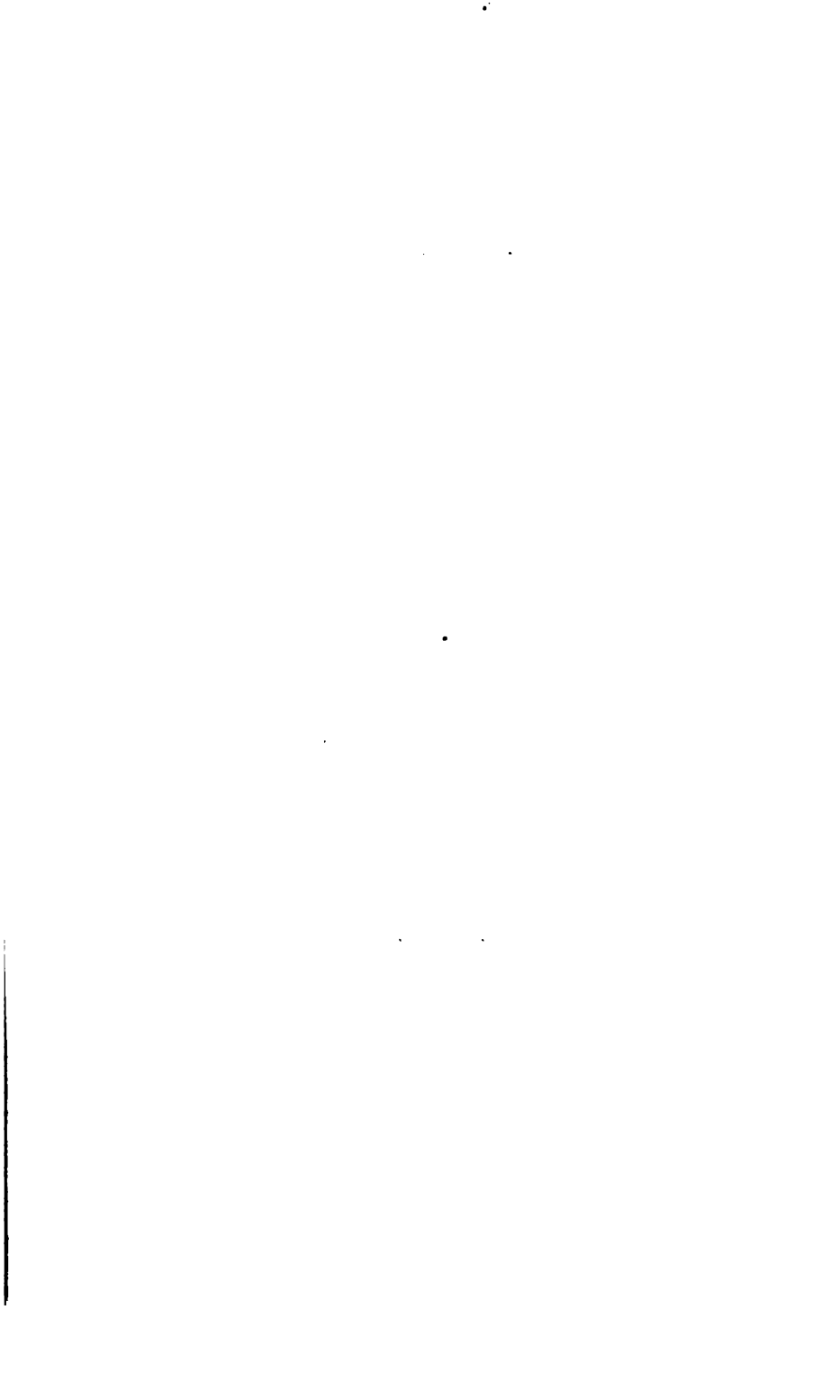


*Fig. 26*



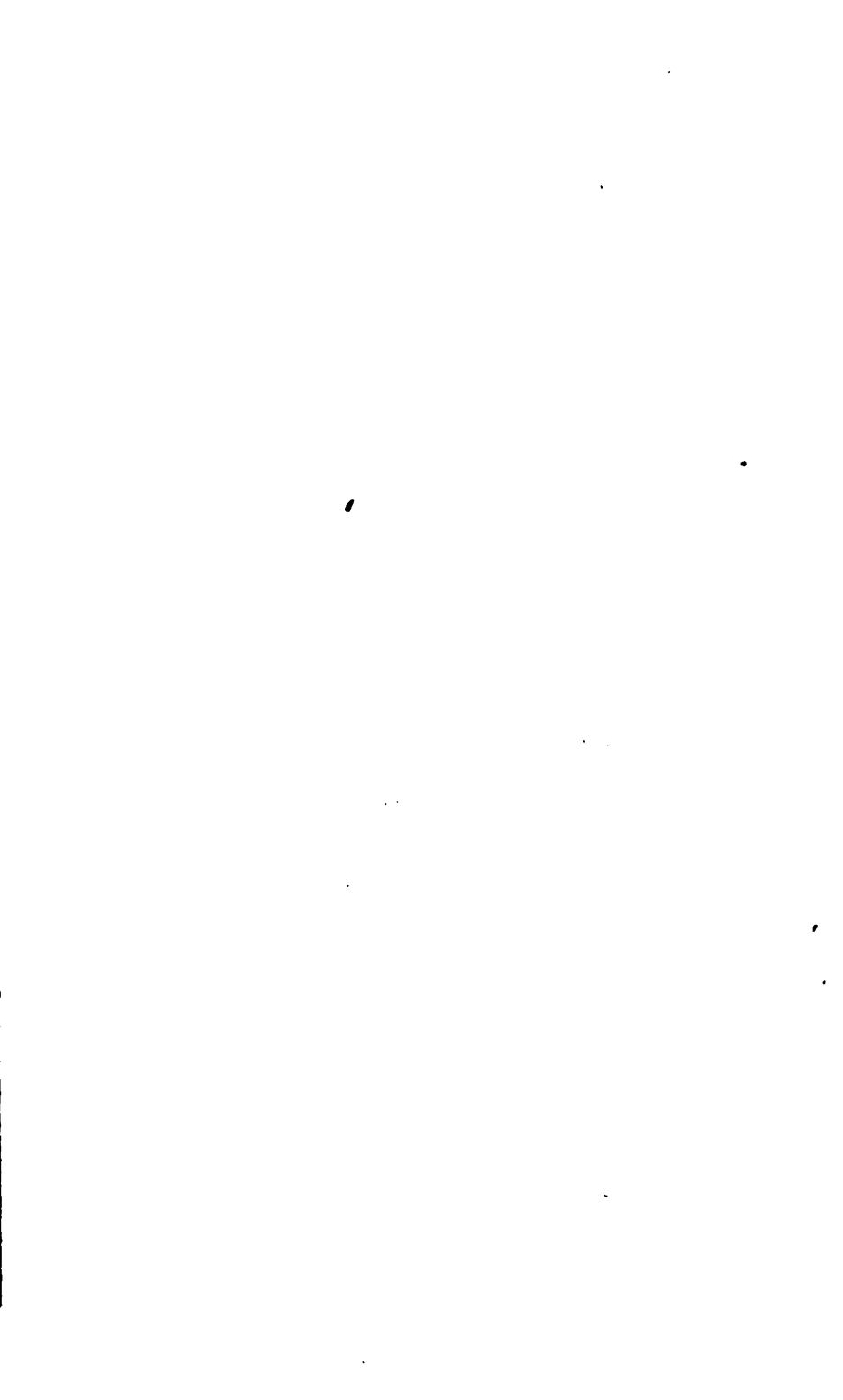


*Fig. 27*









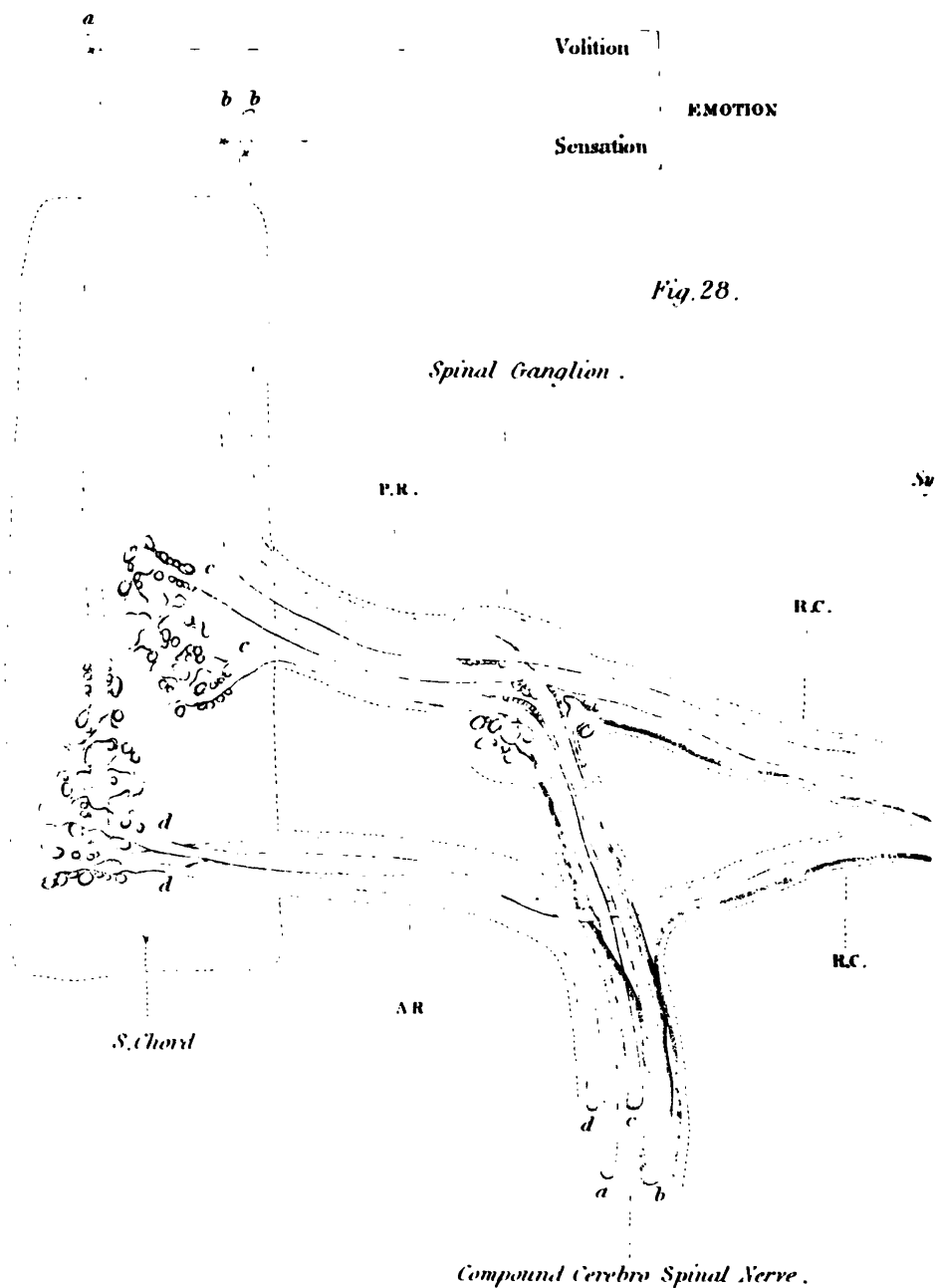


Fig. 29.



pathetic Ganglion.

Fig. 30.

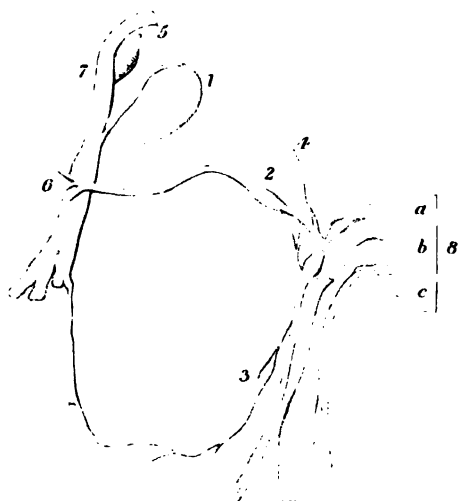




*Fig. 31.*





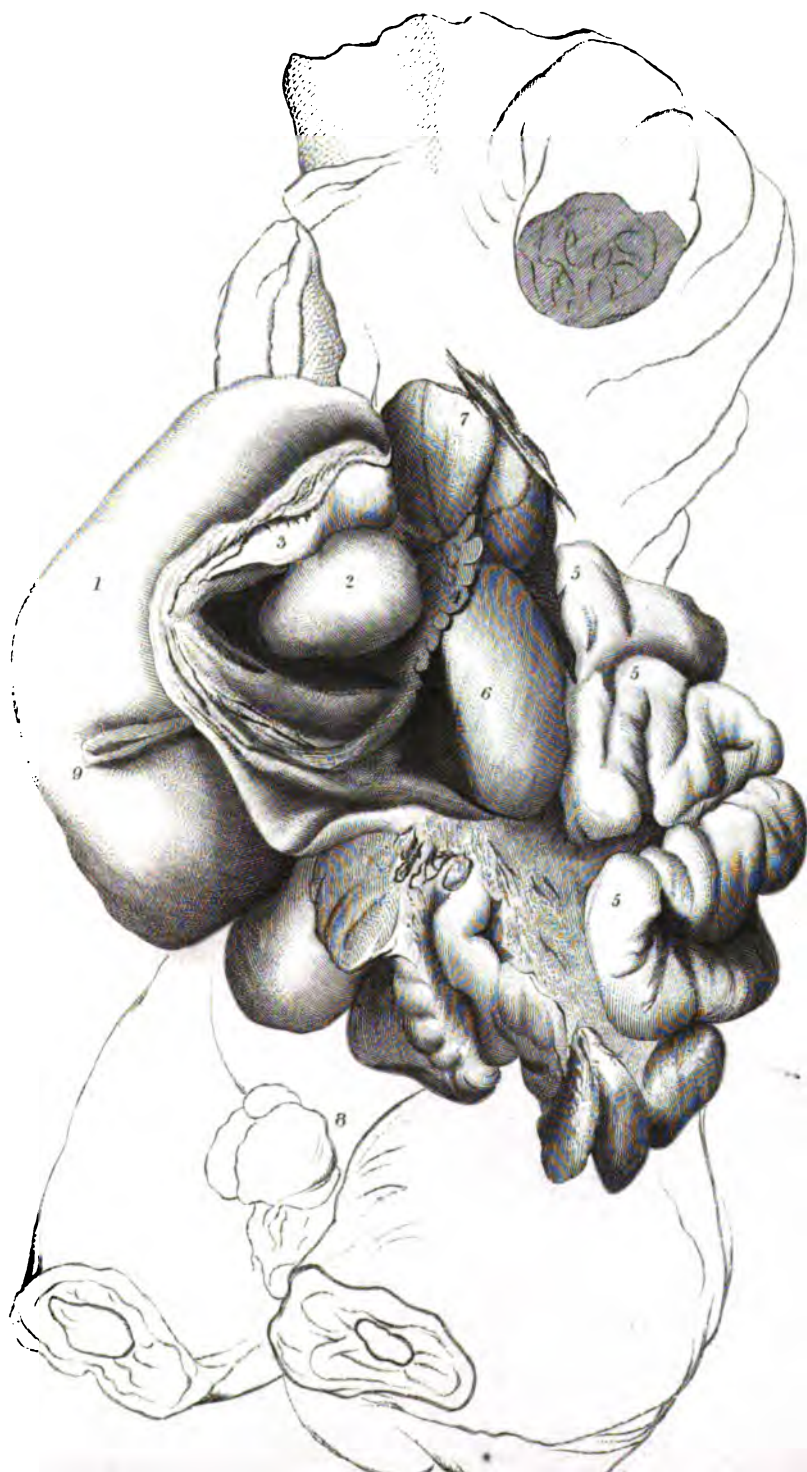










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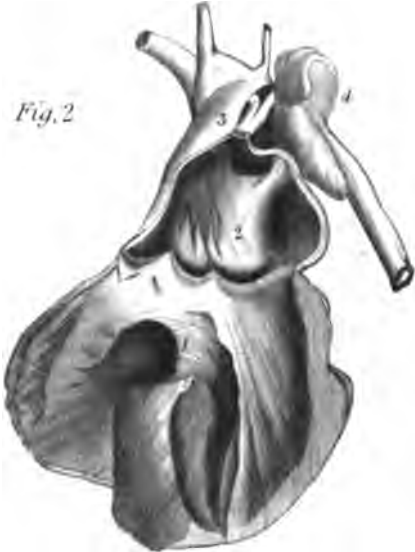


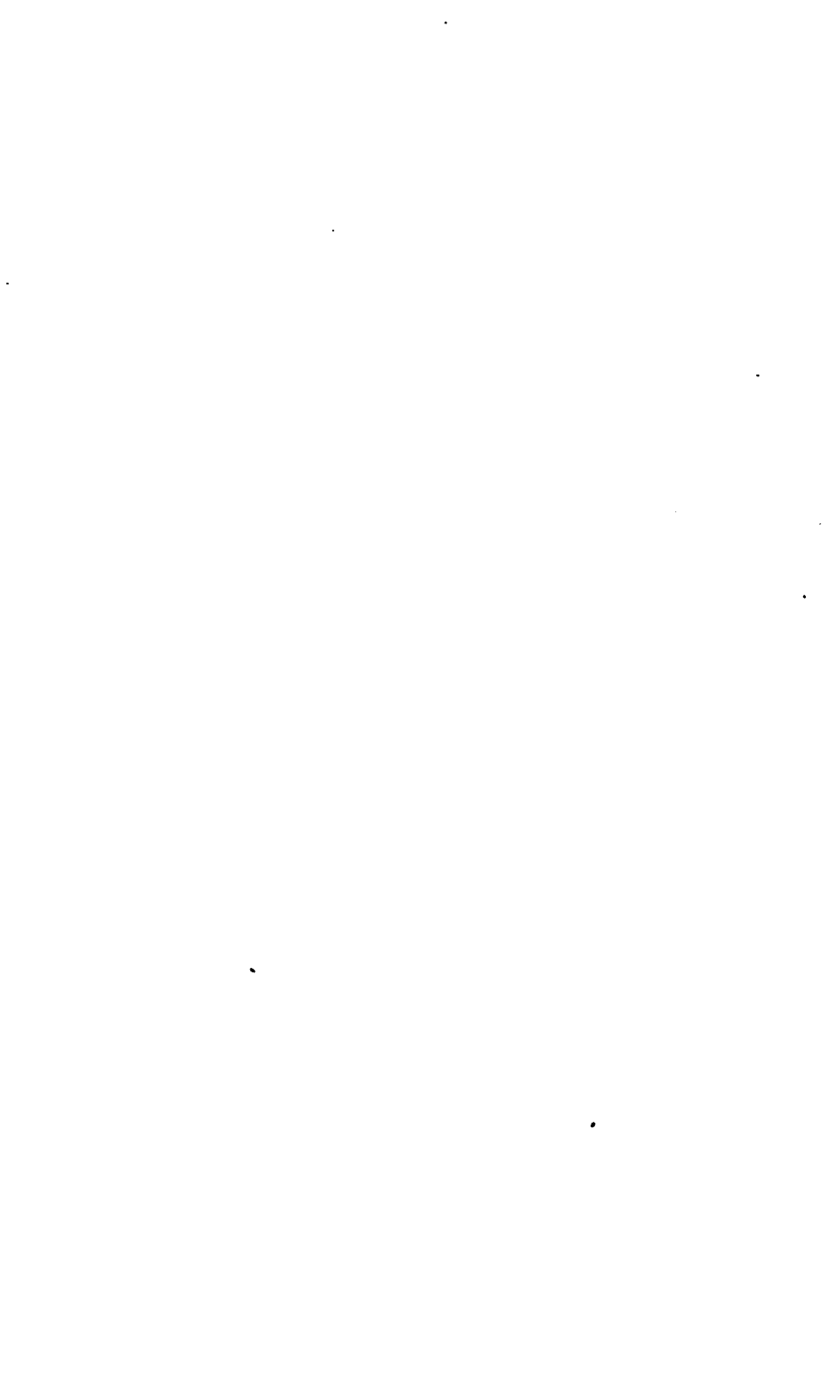
*Fig. 1*



*Fig. 3*







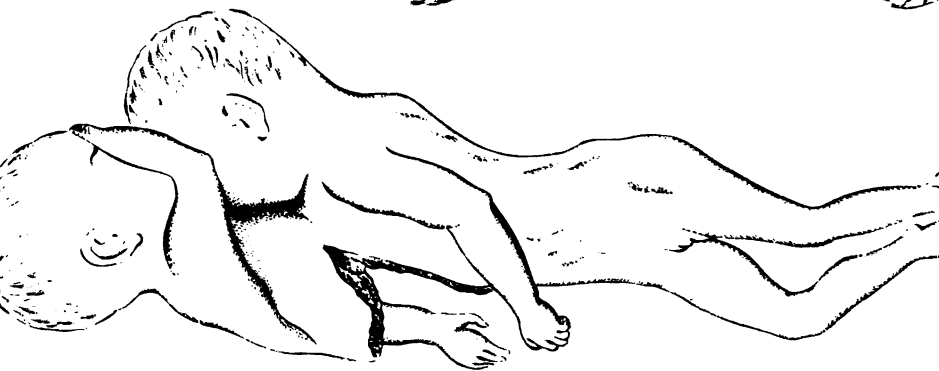


Fig. 1

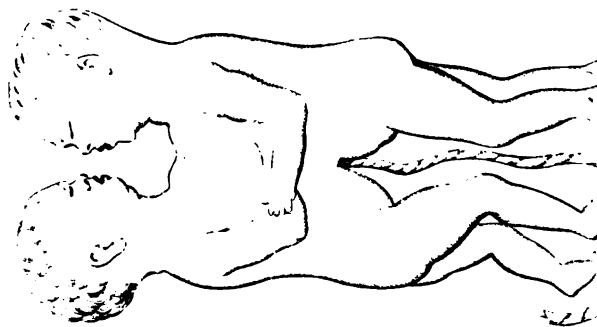


Fig. 2

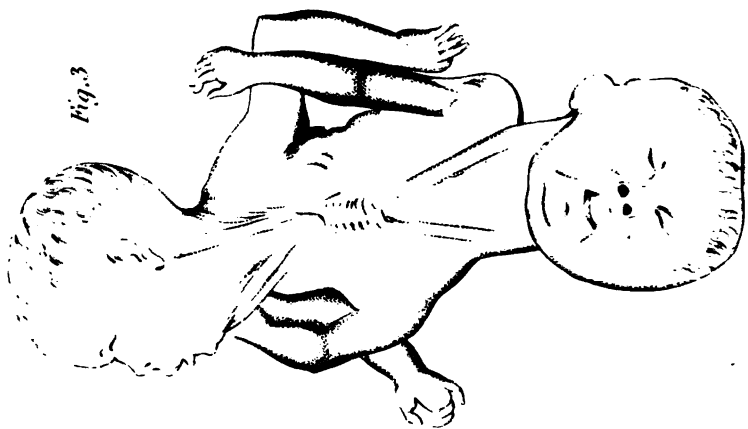


Fig. 3

Fig. 6

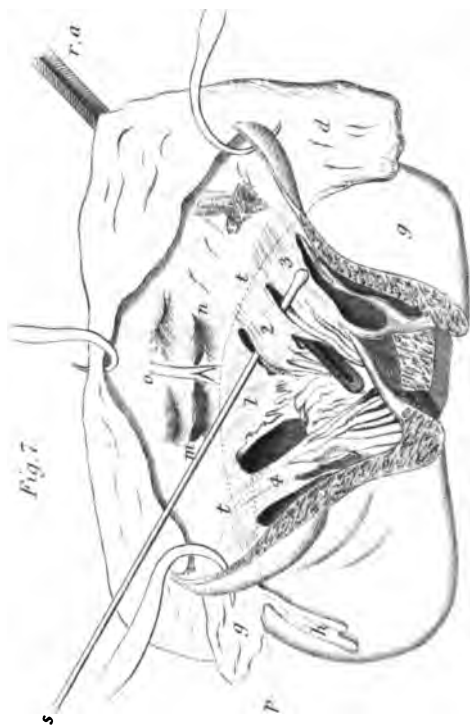
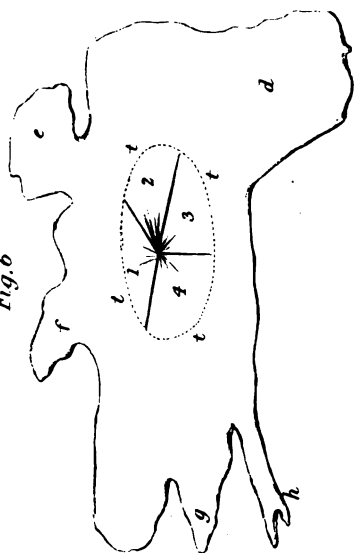


Fig. 7

Fig. 4

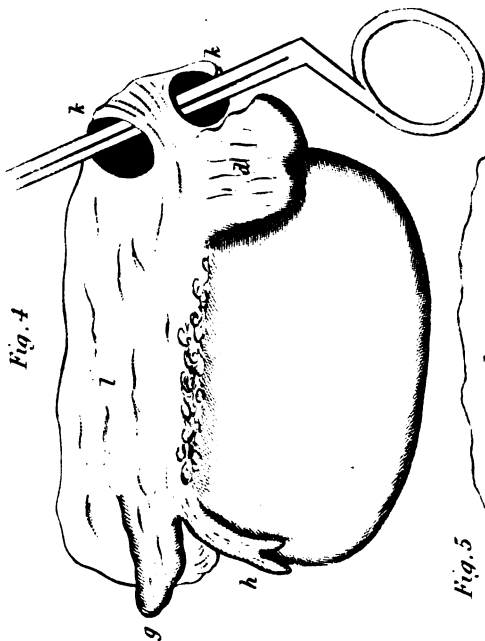


Fig. 5

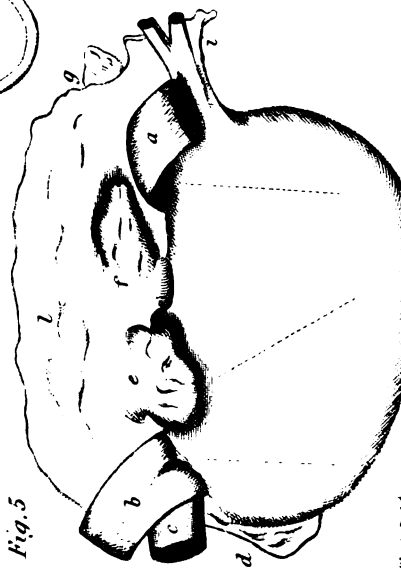










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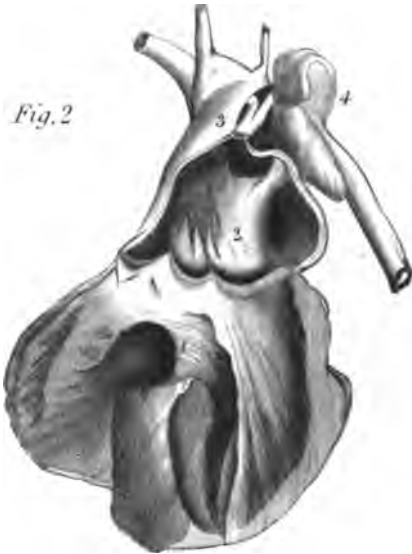


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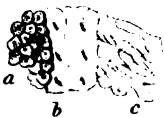


*Fig. 3*









*Fig. 1*

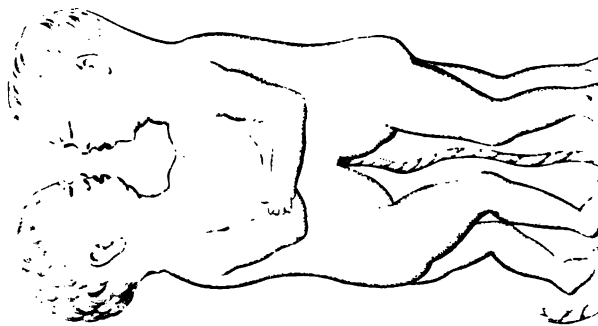


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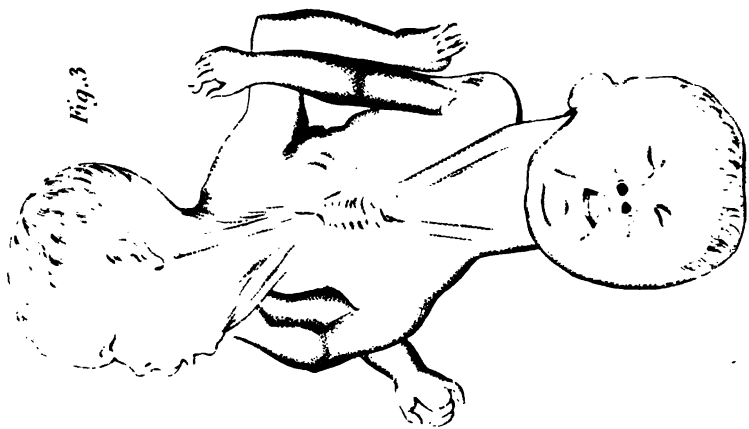


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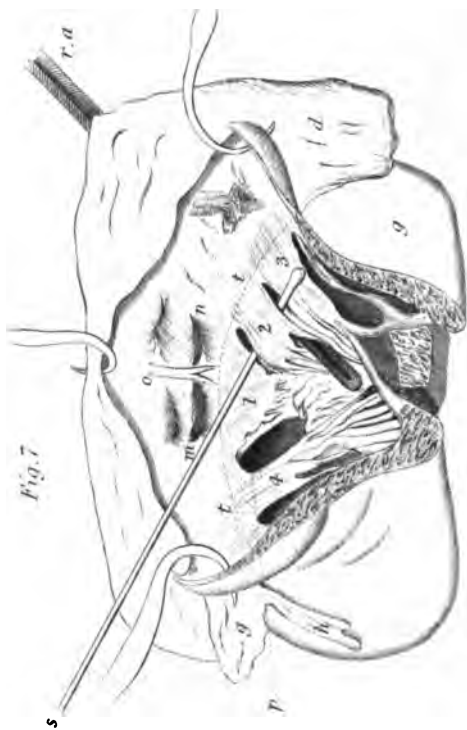
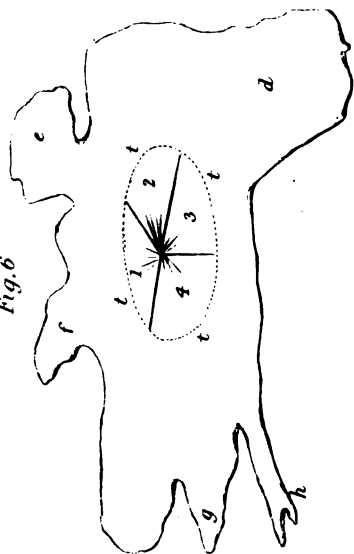


Fig. 4

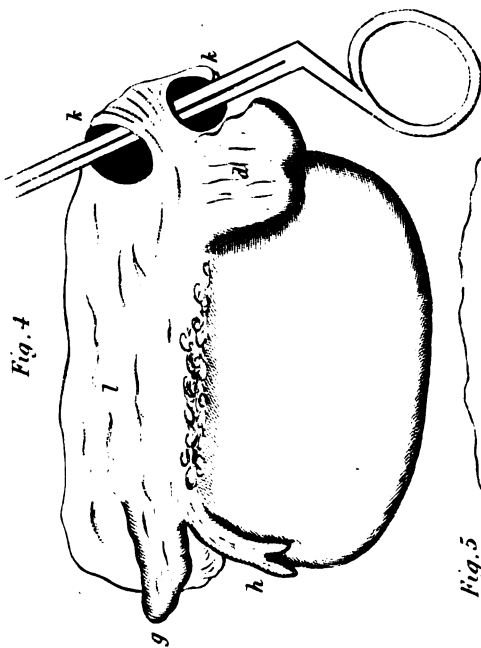
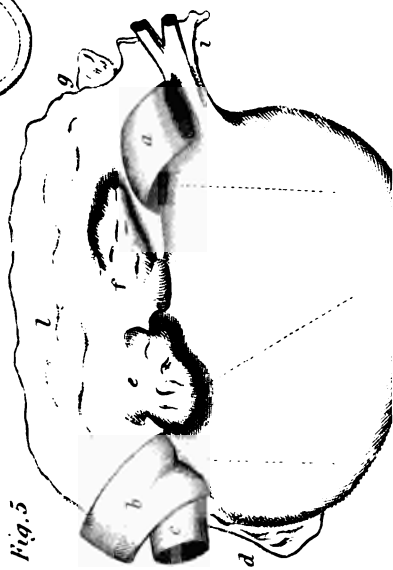


Fig. 5

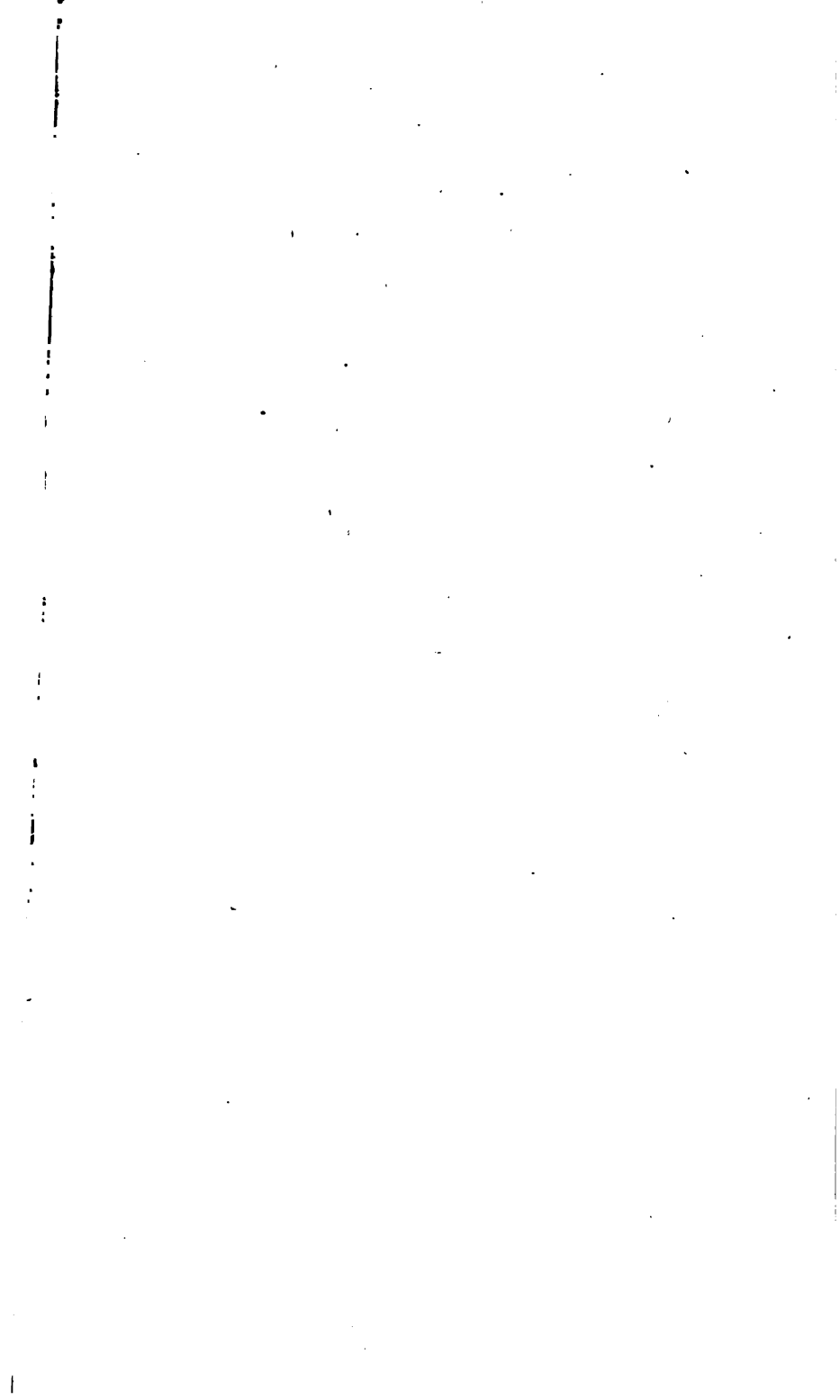














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